THE

JOURNAL OF GAS LIGHTING,

WATER SUPPLY, & SANITARY IMPROVEMENT.

[REGISTERED AS A NEWSPAPER.]

VOL. XXXV. No. 890.] LONDON, JUNE 1, 1880. [32ND YEAR. Price 6d.

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[*As Illustrated and Described in the* JOURNAL *for May* 4.]

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The Patentee having devoted more time and attention to this subject than perhaps any other person living, is now in a position to recommend the adoption of this process to Gas Companies and Corporations with the utmost confidence in its practical utility, convenience, and economy. 1st. It restores the spent Lime at from one-third to one-half its original cost, apart from its undoubted convenience and the economy of space. 2nd. There is practically no limit to the duration of the Lime. 3rd. The cost of apparatus for the introduction of the process is very moderate and exceedingly durable. 4. The Patentee supplies special bricks and castings, erects and proves the process on the most favourable terms.

The process, in operation, may be seen at the Corporation Gas-Works, Paisley, where the Lime has been restored 120 times. Inspection is cordially invited.

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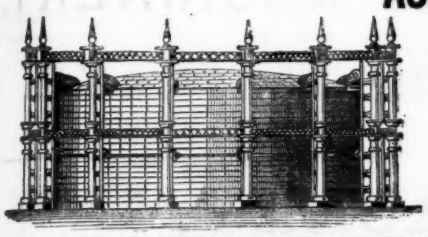

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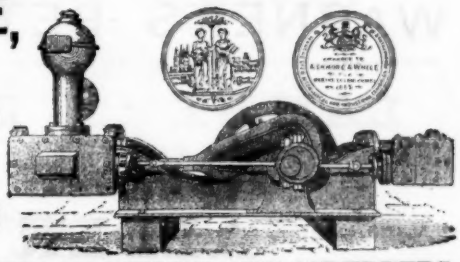

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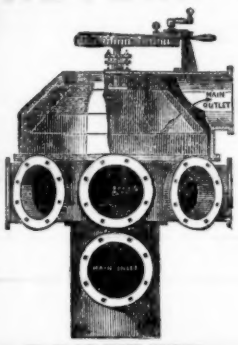
No possibility of Valves sticking, as they are actuated by positive motion from an eccentric.



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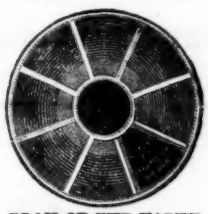

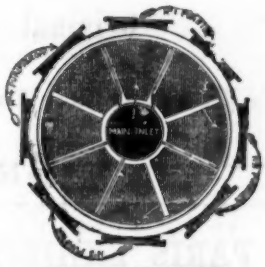

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These PATENT CENTRE-VALVES are the most perfect and certain means for working Purifiers on the system of three in action, and one out of action. The Valve itself is protected from all injury inside the safety cover. The working of the Valve is so easy, and so governed by the stop-catch movement, that the Purifiers can be instantaneously changed in the dark as well as in daylight. They are scraped perfectly true, metal to metal, the facings heretofore exposed are always covered, and there is nothing more reliable, certain, and durable in a gas-works. By their use the floor of the Purifying-house is clear and level; the Valve and all connexions being beneath the floor, out of the way of working. A considerable improvement and saving is effected in the cost of the connecting-pipes.

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ARE NOW PREPARED TO SUPPLY AND ERECT THEIR PATENTED MACHINERY FOR

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And to enter into arrangements with GAS COMPANIES for its use upon moderate terms of Royalty.

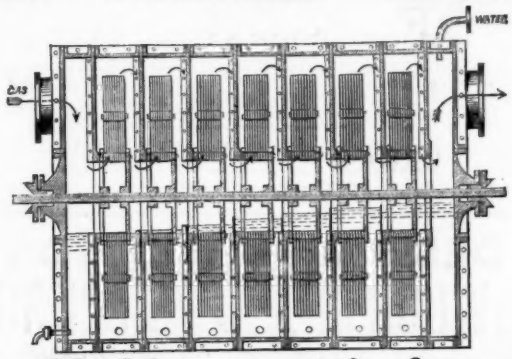
The Patented Machinery has secured the approbation of all Engineers who have visited the MAIDSTONE GAS-WORKS, *where it is in full operation, and may be inspected at any time on application to the Manager.*

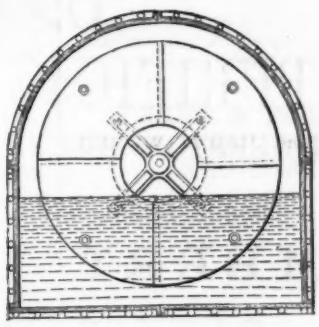
The advantages attending its use are—

INCREASED VOLUME OF GAS PER TON.—INCREASED YIELD PER RETORT.—INCREASED BULK OF COKE FOR SALE.—REDUCTION IN LABOUR AND LESS DEPENDENCE ON SKILLED STOKERS.

A Pamphlet containing a description of the Machinery, and Copies of Reports on the working of the same, &c., will be forwarded on application to the MANAGING DIRECTOR, Maidstone. Communications may also be addressed to the Consulting Engineer, R. P. SPICE, Esq., M. Inst. C.E., 21, Parliament Street, London, S.W., or to the Engineer and Analyst, F. W. HARTLEY, Esq., A. Inst. C.E., 55, Millbank Street, London, S.W.

KIRKHAM, HULETT, & CHANDLER, LIMITED.
PATENT "STANDARD" WASHER-SCRUBBER COMPANY.





These Machines contain from 3200 feet to 65,000 feet of Wetted Surface.

The Special Merits of this Washer are as follows:—That it is not necessary to reduce the temperature of the gas to 60°, or thereabouts, to make it effective; **and that as no tar is retained in it, the illuminating power is not reduced as in Tower Scrubbers.** That the distribution of the liquor is made with unerring regularity. That it occupies very small space, so that it can be, at little expense, effectually protected from extreme changes of the weather. That the considerable expense of Coke or Wood, or other Scrubbing Material, is entirely saved, and that the great nuisance and cost of from time to time replacing the Scrubbing Material is avoided. That, by the revolution of the discs, the quantity of water carried up by them, and tending continuously to fall, exposes a very large amount of fresh wetted surface to contact with the gas as it ascends. That it is particularly adapted for Gas-Works where Sulphate of Ammonia is manufactured. That it is much cheaper than any other Scrubber that will do the same amount of work effectually. That it is the only Washer suitable for purifying Gas from all its impurities by solution. That it works with a minimum of pressure. That it takes out every trace of Ammonia from the Gas in once traversing the machine, as well as a very large quantity of carbonic acid and sulphuretted hydrogen. That it requires very little outlay for foundations.

The following Testimonials show the opinion of eminent Engineers as to the capabilities of the Washer:—

Messrs. KIRKHAM, HULETT, and CHANDLER. *The Gaslight and Coke Company, York Road, King's Cross, Jan.* 14, 1879.

Gentlemen,—In reply to your inquiry, I am pleased to say the Washer which was put in action at this station in October last has quite fulfilled my expectations, as it confirms the experiments I made in May last with the smaller machine. Working at four revolutions per minute, **it takes out every particle of Ammonia,** while purifying more Gas than it was intended to do. I enclose particulars of a week's working during our heaviest make, by which you will see that it yields the full quantity and strength of liquor, and works with little pressure. I am therefore quite satisfied with the machine, and trust it may meet with the success it deserves.—I remain, &c., (Signed) JOHN CLARK, Engineer.

The following Table shows the results of the working of one of these Washers, lately erected to purify 60,000 *feet of Gas per Hour, at the St. Pancras Station of The Gaslight and Coke Company:—*

1879.	Nos. of the Divisions and Strength of Liquor in each.										Water used per Ton of Coals.	Gas Purified per Hour, Cubic Feet.	Ammonia on Outlet.	Temperature.			Pressures.		Revolutions per Minute.
	1	2	3	4	5	6	7	8	9	10				Inlet.	Outlet.	Atmosphere.	Inlet, Inches.	Outlet, Inches.	
	oz.	oz.	oz.	oz.	oz.	oz.	oz.	oz.	oz.	oz.									
January 7	11	9	7	5½	3½	3	1⅝	1½	¼	0	10 Gallons.	59,000	Nil.	74°	66°	31°	25	23¼	5
„ 8	9½	7½	6	4½	3	2	1	¼	¼	0	10 „	78,000	Nil.	73°	61°	31°	28	26½	4¼
„ 9	11	9	7	5	3⅛	2½	1⅛	1	⅛	0	10 „	82,000	Nil.	74°	67°	33°	27½	25½	5
„ 10	10⅛	8½	6⅞	5	3½	2½	1½	1	⅛	0	10 „	66,000	Nil.	76°	64°	28°	28½	27	5
„ 11	12½	10	7⅞	5⅛	4½	3½	1⅝	1¼	⅛	0	10 „	61,000	Nil.	75°	64°	27°	26½	25½	5
„ 12	11	8⅞	6⅞	—	—	—	1¼	⅜	⅛	0	10 „	39,000	Nil.	74°	64°	27°	26½	25½	5
„ 13	13	10⅛	8¼	6	4⅜	3½	2	1½	⅛	0	10 „	78,000	Nil.	73°	65°	42°	28	26	5

Messrs. KIRKHAM, HULETT, and CHANDLER. *Corporation of Birmingham, Gas Department, Saltley Works, May* 23, 1879.

Gentlemen,—I beg to enclose you a copy of the results of the tests which, by the kind permission of the Engineer, Mr. Clark, I made on the 6th of March last, of the working of one of your "Standard" Washers and Scrubbers at the St. Pancras Station of The Gaslight and Coke Company, and I am of opinion that, for an apparatus occupying so small a space, they are exceedingly satisfactory.—Yours truly, HENRY HACK, Engineer.

Working Results obtained from KIRKHAM, HULETT, *and* CHANDLER'S *Patent "Standard" Washer and Scrubber at the St. Pancras Station of The Gaslight and Coke Company, London, March* 6, 1879.

Gas passing per Hour, Cubic Feet.	—	Impurities in Gas per 100 Cubic Feet.			Temperature.		Pressure in Inches.	Revolution of Apparatus per Minute.	—	No. of Divisions and Strength of Liquor.										Water Used during Experiment. Gallons.
		SH_2	CO_2.	Grains. NH_3.	Washer.	Air.				10	9	8	7	6	5	4	3	2	1	
64,000	Inlet	2·00	2·00	158·8	72	57	21	4½	Twaddel deg. at 60°	5·3	4·9	2·85	2·35	1·7	1·05	0·6	0·3	0·15	0·1	63
	Outlet	1·50	1·50	0·8	68	57	20		Acid, ounces.	11·0	8·4	6·3	4·5	2·7	1·7	1·3	0·7	0·3	—	

Messrs. KIRKHAM and HERSEY. *The Leeds Corporation Gas-Works, Meadow Lane, Aug.* 14, 1879.

Gentlemen,—In reply to your inquiry of yesterday's date, I have pleasure in stating that the item appearing as income derivable from Ammonia in my estimate of revenue for current year is not an exaggeration. Our average income from Ammonia is 2s. 8d. per ton of coals carbonized, but at the works where your invention is in use we derive not less than 3s. per ton. Since the introduction of efficient Scrubbers at our works the greater yield of this product (now twice as valuable as coke to us) is such that the cost of Apparatus for its extraction can be wholly paid for out of from nine to twelve months gains. I am, Gentlemen, yours faithfully, (Signed) H. WOODALL, Engineer.

Messrs. KIRKHAM, HULETT, and CHANDLER. *Woolwich Equitable Gas Company, Engineers Office, Nov.* 1, 1879.

Gentlemen,—In answer to your inquiry respecting Washer erected here in September last, and which has been working here constantly since Oct. 1, I beg to say that it is working very satisfactorily. We sell over 24 gallons of 10 oz. liquor per ton of coal carbonized, and depend upon your Washer to extract all Ammonia, which it does satisfactorily, not leaving a trace of free Ammonia at the outlet. It takes little power to drive it, and the difference of pressure between inlet and outlet is scarcely noticeable, being less than half an inch. I consider it a very valuable machine, and have little doubt that it will pay for the outlay in a very short time. I shall be pleased to show it to any one that may be in want of such a machine, when they can see its capabilities themselves.—I am, Gentlemen, yours faithfully, (Signed) W. WHITE, Engineer.

Messrs. KIRKHAM and HERSEY. *Heywood Local Board Gas-Works, Hooley Bridge, Heywood, Dec.* 1, 1879.

Gentlemen,—In reply to your favour of the 28th ult., I beg to state that the Scrubber is at work, and doing well. I shall be glad to show it to any inquirers.—Yours truly, (Signed) EDWIN BUCKLEY, Engineer.

Messrs. KIRKHAM and HERSEY. *Phœnix Gaslight and Coke Company, Office, Greenwich, S.E., Dec.* 19, 1879.

Gentlemen,—In accordance with my promise that I would inform you as to the working of the "Standard" Washer erected by you here in June last, I now write to say that we are passing through it 100,000 cubic feet per hour (the quantity for which it is made) direct from the Condensers, "bye-passing" the whole of our Scrubbers, which, not being needed, have been standing still since the "Standard" Washer was put in use. It seems as though the Washer more effectually removed the Ammonia when taking the full quantity of gas than less; as, at the present time, at the sixth chamber (there being eleven in all) not a trace can be discovered either by turmeric or acid litmus paper. The difference in pressure between inlet and outlet is only ten-tenths of an inch. I need scarcely say, after the above, how perfectly satisfied I am. (Signed) P. J. WATES, Engineer.

For further particulars and testimonials, address Messrs.

KIRKHAM, HULETT, & CHANDLER, LIMITED, { 59 & 60, Palace Chambers, Bridge St., Westminster, London, S.W.

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And Every Description of Best Fire-Bricks.

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Are the Sole Manufacturers of
Archer's Patent Hoists,
ALSO OF
Archer's Patent Stone Breaker,
AND OF
Archer's Patent Ore Crusher & Pulveriser,
The last-named Machine (without the Pulveriser) makes the best and most durable Coke Breaker.

GEORGE'S
Patent Gas Calorigen,
A STOVE FOR
WARMING AND VENTILATING.
RECOMMENDED BY DR. RICHARDSON.

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Gold Medal Awarded, Paris Exhibition, 1878.

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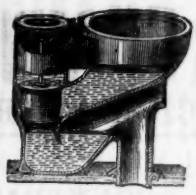

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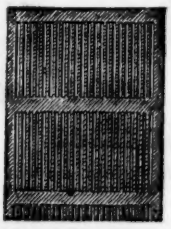
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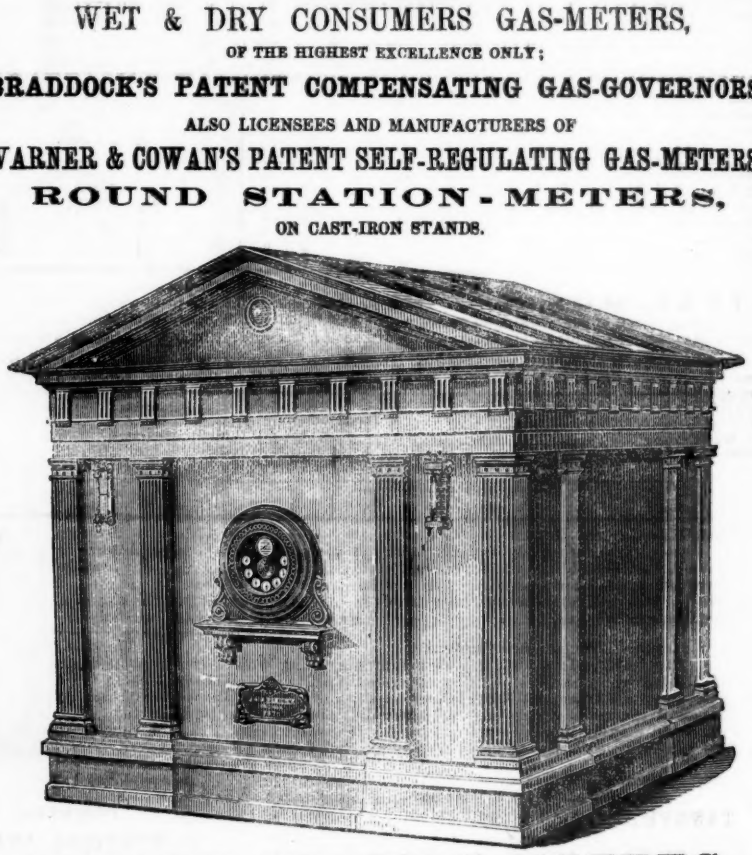

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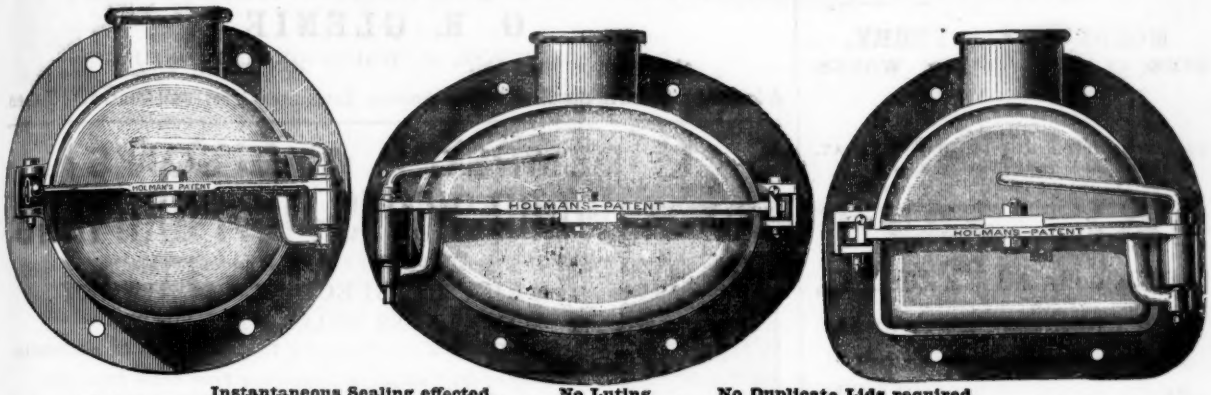


Instantaneous Sealing effected. No Luting. No Duplicate Lids required.
Holman's New Self-Sustaining Cross-Bar ensures freedom of Joint, and maintains parallel position of the Lids.

Morton's Patent Retort-Lids are in use in nearly all the Principal Gas-Works in the United Kingdom and the Colonies; also on the Continent and in the United States of America. They are now made of the

SAME FORM OR SECTION AS THE RETORT. (See Illustrations above.)

Engineers preparing Specifications of New Works will be furnished with Dimensions of Stock Patterns, together with Approximate Weight and other data on application.

HUNT'S
EQUILIBRIUM DIRECT-MAIN GAS GOVERNOR.

In this Governor a Throttle-Valve is substituted for the ordinary suspended Cone, all external communications being avoided by placing the Lever or Radius Arm (shown in the drawing) inside the Valve-Chamber upon the Disc. The Disc is carried upon steel centres, upon which it is accurately balanced and turns freely. The friction in working is thereby reduced to a minimum. This Governor is extremely sensitive to alterations of inlet or outlet pressure, and renders a large actuating holder unnecessary.

These Governors have been adopted by many leading Gas Companies, among whom are the following:—

The Gaslight & Coke Co. (19), The London Gas Co. (3), and at Abergavenny, Arundel, Birmingham, Cannes (France), Devonport, Dursley, Exeter, Guernsey, Halesowen, Leicester, Mentone (France), Monmouth, Newcastle-on-Tyne, Oxford, Plymouth, Rochdale, Windsor, &c.

TESTIMONIAL.

The Gaslight and Coke Company,
9, Water Street, New Bridge Street,
Blackfriars, E.C., Feb. 27, 1875.

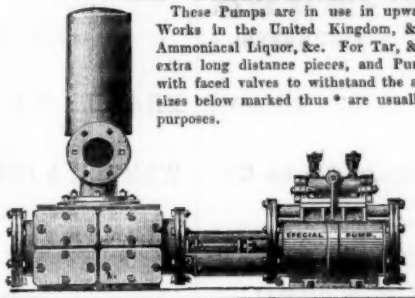
MESSRS. TANGYE BROTHERS AND HOLMAN.

Gentlemen,—The two 24-inch and three 36-inch Hunt's Equilibrium Governors supplied by you, and fixed in the valve-rooms at Whitechapel, Goswell Road, and Blackfriars, are working very satisfactorily.

Yours truly,
(Signed) JOHN JOHNSON.

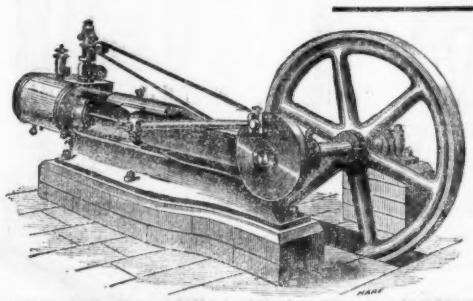
THE
"SPECIAL" DIRECT-ACTING STEAM-PUMP.

These Pumps are in use in upwards of one hundred Gas-Works in the United Kingdom, &c., pumping Water, Tar, Ammoniacal Liquor, &c. For Tar, &c., they are provided with extra long distance pieces, and Pumps are entirely of iron, with faced valves to withstand the action of the liquid. The sizes below marked thus * are usually kept in stock for these purposes.



The quantities delivered of Tar should be taken about two-thirds that of water.

Diameter of Steam Cylndr.	Diameter of Water Cylndr.	Length of Stroke.	Gals. of Water per Hour, Approx.	Prices for Water.	Prices for Tar and Ammoniacal Liqr.
*3 in.	1½ in.	9 in.	450	£16 0 0	£17 0 0
*4 "	2 "	9 "	815	18 0 0	19 0 0
*5 "	2½ "	12 "	1,250	21 0 0	22 10 0
*5 "	3 "	12 "	1,830	22 10 0	24 0 0
*6 "	3 "	12 "	1,830	25 0 0	26 10 0
*6 "	4 "	12 "	3,250	30 0 0	31 10 0
6 "	5 "	12 "	5,070	35 0 0	36 10 0
*7 "	5 "	12 "	5,070	40 0 0	41 10 0
7 "	6 "	12 "	7,330	45 0 0	46 10 0
*8 "	6 "	12 "	7,330	50 0 0	52 0 0
10 "	6 "	12 "	7,330	60 0 0	62 10 0
10 "	8 "	12 "	13,000	75 0 0	77 10 0



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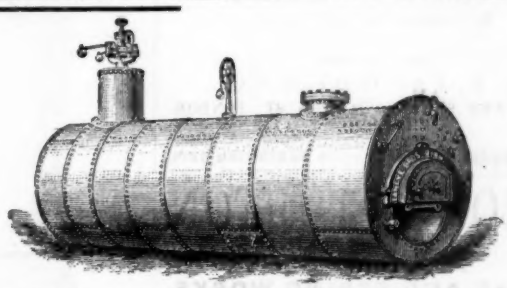
Including Governor and Feed Pump. Variable Expansion extra.



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This Department having been greatly extended and furnished with the most approved Boiler-making Machinery and Tools, T. B. & H. are prepared to supply all kinds of Steam-Boilers with great facility at lowest current prices.

Also Makers of IMPROVED HYDRAULIC HOISTS, TRAVELLERS, CRABS, CRANES, PULLEY BLOCKS, HYDRAULIC AND SCREW LIFTING JACKS, LATHES, PUNCHING AND SHEARING MACHINES,
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Dublin, 1865.

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PATENT DRY GAS-METERS,

The latter being the Highest Medal awarded for Dry Gas-Meters bv the Imperial Commissioners for the Universal Exhibition, Paris, 1867.

Paris, 1867.

THOMAS GLOVER & CO.,

DRY GAS-METER MANUFACTURERS,

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THOMAS GLOVER & CO.'S PATENT DRY GAS-METERS.

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2nd, Are suitable for all climates, whether hot or cold;
3rd, Incur no loss of Gas by evaporation;
4th, Cannot become fixed by frost, however severe;
5th, Are the most accurate and unvarying measurers of Gas;
6th, Prevent jumping or unexpected extinction of the Lights;
7th, May be fixed either above or below the level of the Lights;
8th, Cannot be tampered with, without visibly damaging the outer case;
9th, Will last much longer than Wet Meters;
10th, Will not cost more than one-half for repair that Wet or Water Meters do;
Are upheld for five years without charge.

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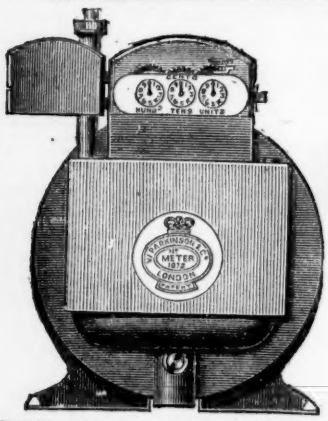

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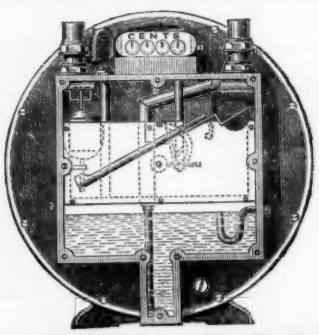
STATION-METERS & GOVERNORS,

EXHAUSTER REGULATORS,

PRESSURE REGISTERS, EXPERIMENTAL APPARATUS, GAUGES, WATER-METERS, &c.

HUNT'S PATENT IMPROVED COMPENSATING METER.

In this Meter, the action of the measuring-drum is reversed. By this arrangement an improvement is effected in the registration at high speeds, which, in many tests, has not varied from the smallest light to three times the capacity of the meter. It works equally well under all pressures. The range of error between the high and low line is much smaller than that allowed by the "Sale of Gas Act."



The Meter has been critically tested, and most favourably reported upon by official Meter Inspectors in London and Birmingham.

W. PARKINSON and CO. have made arrangements for the manufacture of these Meters, both in tin and cast-iron cases, and for the alteration of old ones to this principle, which is confidently recommended as possessing every quality that can be desired by Gas Companies, Corporations, or Private Consumers.

COTTAGE LANE, CITY ROAD, LONDON, E.C.

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TO CORRESPONDENTS.

No notice can be taken of anonymous communications. Whatever is intended for insertion, must be authenticated by the name and address of the writer; not necessarily for publication, but as a guarantee of good faith.

THE JOURNAL OF GAS LIGHTING,

WATER SUPPLY, & SANITARY IMPROVEMENT.

TUESDAY, JUNE 1, 1880.

Circular to Gas Companies.*

We make no apology for recurring to the topics with which we have dealt in our last two "Circulars." It is, in our judgment, better, if questions of policy or conduct must needs be considered and discussed, that they should be looked at rather in times of quiet, such as the present, than left till those periods—usually about the parliamentary session—when they form the themes of more or less angry disputation between opposing parties. The true idea of the system of gas supply, as practised for many years past, has been that of co-operation between the Companies and their consumers. When competition was discarded as a wasteful failure and a nuisance, and the exclusive right of supply practically, though not with absolute legal right, granted in its place, the change was made because it was seen that not one party only, but both, should be gainers. The consumers undertook to deal only at one shop, and to prevent the setting up of a rival, while the Companies were pledged to conduct their business as economically as possible, to charge only a certain percentage as their share of the profit, and to return any balance that might remain over, in the form of a reduction in the price of the article sold. The dealer was entitled to his fair but defined share, and to certain securities for its regular maintenance; the purchaser was equally entitled, without any question of grace or favour, to all the rest. It is singular that such an understanding, so judicious as it appears to be, and although fenced about by conditions designed to secure its loyal observance, has not only failed to produce a sense of community of interests, but has not diminished appreciably the feeling of distrust with which the consumer regards the producer. Perhaps the habit so common, and so much to be regretted, of looking only at one side of a contract or a question, is largely responsible for the failure. We believe that the interests of Gas Companies are in no way antagonistic to those of the consumers, but rather that they are to a great extent identical with them. It is because we believe this that we feel it is desirable to discuss questions of difference as they become apparent, and to discuss them not with the object of proving one side right and the other wrong, but to find a way of reconciling differences and producing harmonious action.

Accepting, then, the fact that there has been suspicion and distrust experienced generally by consumers as to the treatment they have received from the Companies, to what is it to be ascribed? We believe that it has been in great part due to the neglect by them (the consumers) of means placed at their disposal by the Legislature, whereby they could acquaint themselves with the real position and profits of the Companies, and so ascertain whether the price charged was excessive, and a reduction possible. It is remarkable how slight has been the use made by Local Authorities or others of this power to investigate the accounts; and we can only suppose the penalty attaching to a frivolous application—that of bearing the costs of the inquiry—has had a deterrent effect. A better arrangement would probably be that the investigation, when required, should be paid for out of municipal funds. The basis of all such inquiries being that the Company is entitled to receive its maximum dividends, and to build up a reserve-fund before granting a reduction, there can be small reason why facilities should not be freely afforded, and such inquiries rather encouraged than otherwise. Companies granting such encouragement to investigation would find advantage to themselves as well as their consumers. Bad times will inevitably follow good ones, and the same machinery which proved the necessity for a decrease would equally justify an increase. The materials for constituting a friendly arbitration court are provided; it should be possible to work it to the satisfaction of both parties.

It is a mere truism that the monopoly granted to the Companies was never intended simply to secure full dividends to the proprietors. It was accepted as promising greater advantage to the public generally, and consumers in particular; and it would have been impossible but for the regulations which accompanied it. The Committee which sat in 1867 on the Metropolis Gas Act Amendment Bill expressed not only their opinion but an accepted principle in the first of the series of resolutions they adopted: "That the supply of "gas [in London] ought to be controlled in favour of the "consumers, either by the means of an effective competition, "or if the system of an exclusive supply is maintained, by "the means of effective regulation." Competition having proved a failure, being, in fact, a weapon as certain to injure those who wield it as those against whom it is directed, regulation is the more hopeful alternative. The fault is with the parties and not the method when that too fails, and, as we have so often seen, a condition of hostility arises which is only ended with the extinction of the Company. There has, we believe, been little, if any, disposition to evade the conditions. Companies have felt honourably bound to conserve the interests of their consumers in return for the security they enjoyed, and a fuller acquaintance with the facts would probably satisfy most Local Authorities on this head. Hence it is that we would have the most complete information freely granted. Of course, there is an exception to this position in the case of those Companies to whom we referred last week, who, contemplating an early application to Parliament, may well feel afraid of making concessions which are otherwise due. The acceptance of the sliding scale in times like these is unquestionably attended with grave risk. It would be unwise—to use a mild word—on the part of any Company now doing their best to supply gas as cheaply as possible to accept their present price as the initial one under the new arrangement, and yet it is not easy to prove a case for a higher. The cost of almost every commodity used on gas-works is exceptionally low, but there is no immediate prospect of a considerable rise. When such a rise does come it will press heavily on the Companies, and it will be hard indeed if, from no fault on their part, the dividends to which they have for years been accustomed are reduced. It is difficult in times of great prosperity to realize the possibility of adversity; but such times will recur, and in the case under notice may even be very close at hand.

Thus, then, two opposite evils are before us—the one to

* In last week's "Circular" two errors occurred, which we are anxious to correct. The first was in the ninth line of the second column of page 785, where "ten and three-quarters" should have been printed as "ten and a half." The second was the use of the word "conjunction," instead of "competition," in the thirteenth line from the bottom of the first column of page 786.

which we referred in our last "Circular," resulting from the obtaining of a high initial; the other from too low an one. In the first case, high dividends will excite the greed of Local Authorities, leading probably to purchase and extinction; in the second, a low initial will lead to reduced dividends. Avoiding Scylla we encounter Charybdis; but it is certain that if, in this case, a choice between the two evils is possible, most Companies would prefer the former, and none could blame them. There is yet another contingency. The evil time of diminished profits may follow upon a period of high dividends. In this case those who have bought shares at high premiums will find themselves heavy losers; they will naturally cry out for economies, bad times may be experienced by Directors and Officers, a system of "rigid economy" set in, and bad be thus inevitably made still worse. The advantages attaching to constancy and stability of dividend are great, and should not be lightly surrendered. There is, at least, a danger that under the operation of the sliding scale there may be considerable fluctuations of dividends, and temptation thus held out to speculation in gas property to which hitherto it has offered no inducement.

The introduction of the sliding scale will, in fact, vary the character of gas business, not in one particular but in several. That it has advantages all those who believe in the frailty of human nature will admit. We, for our part, express a hope that the old safeguards against that frailty may be more fairly tried before they are finally surrendered as failures. The central idea of the sliding scale, as well as the arguments by which it was recommended, justify a suspicion of it, and suggest the necessity, where its adoption is proposed, for great care in fixing an initial price. There are few Gas Companies who would have the courage deliberately to ask for larger dividends than their present maximum; there are none who are, or should be, willing to accept less. The suggestion has been made—and, especially in view of the difficulty of arriving at a fair initial price, we think it still worthy of consideration—that there should be a range of price within which the dividend should not alter. Say, for instance, that the present price is 3s. 6d.; then, if it were reduced below 3s. 3d., the dividend should increase, and it should not diminish till the price went above 3s. 9d. While such an arrangement would not nullify the arguments of those who advocate the sliding scale, it would, in our opinion, render its adoption more simple in many ways, and minimize the objections that may fairly be raised against it.

For ourselves, we shall be glad to see Gas Companies before Parliamentary Committees willing to carry on their duties upon the terms which have hitherto been considered satisfactory, and which have so much to commend them. If the sliding scale is to be adopted, let the suggestion come from the opponents of the Companies, and every effort be made to obtain a liberal initial price; further, we would say, let provision be made in good years for times of possible famine which may follow. The accumulation of a good reserve-fund will prove of the utmost value, tending, as it would, to check the early division of large profits should they be earned, and also removing the liability to those considerable fluctuations of dividends which are so undesirable, and which must attend the operations of a Company without a reserve. Above all, let the desire to make large profits not clog or impede the effort to make the supply of gas both economical and satisfactory to the consumers. There is a large field yet for increased business, and every reduction in price or improvement in quality makes competition less possible, and the property proportionately more secure.

Difficulties and hard times were the lot of Gas Companies until comparatively recent days, but their strength has only increased with the exercise of it in fighting through. The coal famine and the electric light scares are too recent to allow of our assuming that such times cannot recur. Our hope is that, if they should, the old vigour will be found unabated, either by length of days or extreme or unbroken prosperity.

For some time past a very large and unusual amount of attention has been given to experiments upon the best means of obtaining in ordinary use the fullest possible proportion of the illuminating value of gas as supplied to the public. Experiments, correspondence, lectures, have been published to help consumers to see their way out of wasteful dimness into economic light, and last week an important addition was made to these efforts in the form of an article of three columns length in *The Times*. Though travelling over well-known ground, and dealing for the greater part with familiar facts and illustrations, it was a contribution of much value, not only from its own intrinsic merits, but because of the wide circle to which, either directly or indirectly, in whole or in part, it will be sure to reach. The article was suggested apparently by, and is principally devoted to a criticism of various experiments in the direction of improved street lighting, and the practical outcome of them. The writer had evidently taken pains to inform himself well upon the subject on which he had undertaken to write, and the facts are consequently stated with a correctness often conspicuously absent from contributions on technical subjects to the public journals.

We think that in such a notice, which is largely of a historic character, it would not have been out of place if there had been accorded to one gentleman the credit which is usually given to him who leads the van in difficult work. To Mr. Sugg, undoubtedly, is due the honour of having been first to see the need that existed, and then to take in hand those improvements, both in burners and lanterns, which have borne such excellent results. Others have entered the same field, and are cultivating it with much success; but we should be sorry if the credit due to Mr. Sugg for the inception of the idea of competing with the electric light, burner for burner, was in any danger of being lost sight of. The success which has attended these efforts to improve the lighting of our streets is not only very gratifying from the standpoint of the public and the Gas Companies, but it has also removed or modified an erroneous opinion generally entertained as to the objection of Local Authorities to any improvement which costs more money. Considering how young the movement is as yet, we think it reflects credit on those bodies that large lights, costing from £30 to £40 each per annum, are to be seen so liberally dispersed over London and in many provincial towns. We do not doubt but that the unwonted pleasure of finding their action generally approved by the public and the press will be to them a grateful reward, and will stimulate them to merit it still further.

There is one passage in the article which we reproduce, because it deals with an acknowledged evil—one that is being grappled with by many Companies, and we hope will soon be recognized by all. After speaking of the wasteful character of many of the burners in use, and the ignorance of the fitters who supply them, the writer says: "Nor should the "action—or rather inaction—of the Gas Companies pass "without notice here. They remain perfectly apathetic "under the circumstances, and although it is not compulsory "that they should show their customers how to use in an "economical manner the gas they supply to them, they at "least lay themselves open to suspicion when they knowingly allow them to waste it from sheer ignorance." There is, we know, a prejudice in the minds of many consumers against advice given to them by agents of the Gas Companies. We have known frequent cases where good and economical burners have been refused, though offered gratuitously, from the fear that they were intended to consume more gas. It is, however, certainly the fact that the comfort of the users of gas could be greatly increased, and their bills in many cases lightened, if the Companies would take some pains to direct them in these matters. We believe that the idea has been seriously entertained by several of the London Companies, of opening permanent show-rooms, if not sale-rooms, of gas apparatus, burners, and fittings such as they would recommend. The examples of the Paris Gas Company and the Liverpool Fittings Company should give great encouragement to such an intention, and we heartily hope that before long the purpose will have matured into action. The bright possibilities which *The Times* sees before Gas Companies, arising from the application of gas to the purposes of heating, cooking, engine-driving, and for railway carriage lighting are all fast becoming accomplished realities. For our part, we gladly welcome every fresh development of the uses of gas, and rejoice to see it established more and more firmly as one of the indispensable necessaries of modern life. At the same time there is an enormous field for this increase of the business in the immediate future, in the vast number of houses still in the darkness of lamps and candles, and from the more perfect lighting of premises generally and of public ways. Gas *light* has so vast a field before it yet, that we anticipate the anxiety will shortly be, not how is an increased rental to be obtained, but, rather, where is the gas to be obtained from. Sufficient to the day is its own perplexities; but the growth of the Beckton works during its still short life is suggestive.

The seventeenth annual meeting of the members of the British Association of Gas Managers will be held on the 8th, 9th, and 10th inst., at the Institution of Civil Engineers,

Great George Street, Westminster, and there is every indication that it will be attended with at least as much success as any of its predecessors. The presidential chair will be filled by Charles Hunt, Esq., C.E., of Birmingham, and the programme of papers to be read is highly promising. Mr. Travers, of Cork, will deal with the subject of the Thermal Power of Gas Cooking and Heating Apparatus—a subject which affords wide scope for illustration from points of view other than the manufacturers, whose advertising statements form the great bulk of the literature of this subject. Mr. G. E. Stevenson will discourse on Regenerative Furnaces for Heating Retorts—a question of the internal economy of gas-works that is rapidly coming to the front, and on which Mr. Stevenson is qualified to speak with some authority; while Mr. F. Livesey will deal with the subject of Retort Furnaces generally. Mr. George Livesey and Mr. W. Romans both address themselves to the matter of Gasholder Tanks, while Mr. G. Baker, of Birmingham, will treat of Gasholders, chiefly with relation to their construction. Mr. Harrison Veevers is to give his experience of Testing Gas Coals, and Mr. G. E. Stevenson has a second innings for the purpose of bringing up the subject of Working Statistics. The Chemistry of Spent Lime will be elucidated by Mr. Wm. Foster, of London; and another point of internal administration will be touched upon by Mr. J. Somerville, who will describe "An Apparatus for Preventing the Oscillation caused by the "Exhauster, and for the Removal of Tar." Mr. F. W. Hartley will find himself at home in treating of Standards for the Estimation of Illuminating Power, and a lively discussion is likely to follow the reading of Mr. George Bray's paper, which bears the somewhat combative title of "Some Fallacies "Regarding Gas-Burners, with Remarks on Street Lighting." It is scarcely to be expected that the whole of these papers can be read and adequately discussed in the two days set apart for the purpose; and when all appear so promising of interest, the Committee will have no easy task in arranging the order in which they will be taken. The lecture to be given at the evening meeting on the 8th inst., by Greville Williams, Esq., F.R.S., "On the Past, Present, and Future of "Coal Tar," promises to be, in the hands of such a master of this particular department of practical chemistry, a highly interesting and instructive account of one of the most wonderful substances known in the whole range of the Industrial Arts, and which has given modern analytical chemistry a field whereon some of its most brilliant triumphs have been achieved. A steamboat trip to the Beckton works of The Gaslight and Coke Company, where great additions have been made, and extensive works established for the manufacture of residual products, since the last visit of the members of the Association, will terminate the proceedings of the meeting.

The Lincoln Gas Company have consented to sell their undertaking to the Town Council, on terms to which the latter were not slow to agree. The Council are to pay the Shareholders annuities equal to maximum dividends on all the Company's shares and stock, amounting to a yearly charge of £5024, and also a sum of £2500 as compensation to retiring officers. For this consideration the Town Council will become possessed of a fine property, which has been well managed by its present owners, and has paid full dividends with a low selling price. The works are in good condition, no extraordinary immediate outlay for manufacturing or distributing apparatus being needed; and the reserve-fund, which goes with the other property, is £8457, out of which the compensation payment already mentioned can be taken. Thus, without having to meet any charges worth mentioning, the Town Council will become the owners of a concern yielding a profit of about £2000 annually, which let us hope they will administer truly for the benefit of the ratepayers, not forgetting that the majority of the gas consumers are numbered among the new proprietors, and will probably expect to be considered when the profits are distributed.

The Alliance and Dublin Consumers Gas Company are about to raise the additional capital authorized by their existing Act of Parliament, by issuing 5000 new shares of £10 each, the dividend on which is to be limited to 7 per cent, and will be controlled in the same way as the older stock. The Chairman, at a meeting of Shareholders in the Company held last week, in proposing the resolution authorizing the Directors to issue the new shares, took occasion to express his conviction of the continuance of the present favourable state of the Company's business, and said he had no fear that the old stock would fail to pay full dividends. The Company may, in fact, be described as having only recently entered into their inheritance, and their operations will probably extend without interruption for many years, while the principles of management which have infused new life into the concern are adhered to in their integrity.

The Bedford Gas Company have had a lively passage of arms with the Town Council, respecting the manner in which the Company have fulfilled their statutory obligations. The Company, it is alleged, have not furnished the Corporation with yearly statements of their accounts, and have not provided a proper testing-station; besides which there are the usual complaints of high price, low illuminating power, foul gas, insufficient supply, &c. As to the first offence, to the commission of which the Company practically pleaded guilty, at the same time sending in copies of their balance-sheets for the past fourteen years, we hold that undue secrecy in such matters is a great mistake in the interests of Gas Companies themselves, for where the working statements of such undertakings are kept in the dark, extraordinary opinions respecting them are always formed by the public, whose overheated imaginations frequently represent a Company as gorged with wealth, when perhaps the object of their unjust suspicions can only just make both ends meet. So it is with testing. Regular notifications of the illuminating power of the gas supplied are very useful; not that they prevent grumbling, for nothing will do that, but they supply a ready weapon for demolishing the loudest malcontents, who are almost invariably the worst-informed members of a community. In Bedford, for instance, one of the levers which moved the Town Council was a memorial—signed by about a score of persons, among whom ladies and clergymen were conspicuous—which alleged, among other things, that the Company's mains are insufficient in size, and frequently become choked, and that the consumption of gas is accordingly increased. Again, it was stated at the Council meeting that the consumers wanted to get rid of the "stuff that blacked their ceilings." Against the rising tide of indignation the Company submitted a statement to the effect that their full dividends had only been paid during the past four years, and that they had continually expended money in renewing and enlarging the mains, and in other works for improving the distribution of gas throughout the town, and that the price at which they sold gas—3s. 9d. per thousand feet—was fair and reasonable. Perhaps, however, when their larger mains are laid, the Company will see their way to a reduction in price which will keep matters going pleasantly again when the present agitation has spent itself.

The meeting of the Liverpool Gas Consumers Defence Association, which was held recently, appears to have been the occasion of the exchange of much mutual congratulation among the members present. Dr. Cross is evidently held in high honour by such of his fellow-citizens as have enrolled themselves in this body, on the ground of his having *suo Marte* brought the price of Liverpool gas down from 4s. 6d. per thousand feet in 1875, to 3s. 4d. at the present time, the general satisfaction at which result was only tempered by the reflection, on the part of the Chairman, that there was still something radically wrong with the Gas Company, and that the struggle with that erring corporation was in reality only begun. To what extent the indignant Chairman and the magnanimous Dr. Cross—who, as we learn, declined the testimonial inevitably offered—are prepared to drive the Gas Company in the way of reduction is not indicated, but probably depends upon the state of the funds, which, however, all parties agreed to take especial care of, as the Committee had experienced great difficulty in collecting the money, and were evidently doubtful as to the willingness of an ungrateful public to subscribe any more. In case Liverpool should prove unsympathizing, Dr. Cross should beat a retreat to the banks of the Irwell, and attack the great "monopoly" which, under a different title, he will there find maintaining prices as high as the rates of which he now complains.

Gasholders and tanks show a remarkable tendency to grow with the times. Every year produces a yet more gigantic example of this department of gas engineering than had been in existence before—the greatest diameter of one season's triumph paling before the commanding height of the next; and this, again, enjoys but a short-lived supremacy before it in turn passes into the second rank. Mr. Corbet Woodall's Kennington Lane monster is no sooner an accomplished fact, than Mr. George Livesey's interesting bantling engages general attention; or the Stepney holder takes the precedence, only to yield to provincial rivals in girth. The Corporation of Birmingham, acting under the advice of Mr. Charles Hunt, their Engineer, are about to construct two tanks at their Windsor Street works, each of which will be 240 feet in diameter and 51 feet deep. Messrs. John Aird and Sons are the contractors for this great work, an idea of the magnitude of which may be formed from the fact that six million bricks will be required in carrying it out, and seventy thousand

cubic yards of surplus soil and rubbish will have to be removed from the land belonging to the Corporation. These tanks will exceed in diameter anything of the kind that has ever been constructed, and the action of the Gas Committee shows that Birmingham is determined not to drop behind the age, even in gas apparatus.

The papers read at the recent meeting of the members of the West of Scotland Association of Gas Managers were fairly divided, as to their subjects, between theory and practice. Mr. Niven's paper on thermometric and barometric calculations was very ingenious, and his two rules for making corrections of volume for temperature and pressure, if not altogether independent of pencil and paper in ordinary hands, are still commendably brief, although it would have made the demonstration of them clearer, and rendered them easier of remembrance, if Mr. Niven had condensed them into algebraic formulæ, in which they would have appeared much simpler than in the verbal rules. Mr. Mayer's explanation of Painter's hydrostatic joint for main-pipes was the occasion of much discussion, which seemed to be strongly imbued with the spirit of opposition to all novelty. Nothing is more difficult than to induce a fair trial of any improvement which involves fundamental change in the methods of doing everyday work, such, for instance, as main-laying; and although the defects of the caulked lead joint are well known, a tremendous amount of *vis inertiæ* must be overcome before people who have grown accustomed to its rough-and-ready character can be persuaded to look seriously at any proposal for doing away with it. We do not express any opinion respecting Painter's joint in remarking that only after proof of its reliability and economy after severe trial, under conditions to which persons accustomed to the ordinary systems of main-laying are familiar, could its advocates hope to meet with a different reception than appears to have been Mr. Mayer's experience.

In a communication which will be found in another column, Mr. R. H. Patterson draws attention to the lessons which the study of the blowpipe may teach respecting the principles of gas illumination. There would not at first sight appear to be any two applications of the power of gas more widely distinct than the instances of a blowpipe and an Argand burner, yet slight reflection will at once show that in their dissimilarity of action, resulting from different combinations of the same agents, there should be something deserving of study. Mr. Patterson exposes the fallacy of the idea, so generally held, that a blowpipe flame is necessarily hotter than any other flame, the truth being that the heat is only concentrated; but, being concentrated, why is not the flame intensely brilliant? And since concentration alone will not suffice, under what special conditions must the heat of a gas-flame be produced, in order that brilliancy may also be secured? These are the questions which Mr. Patterson sets himself to answer, and he could not do the cause of gas illumination better service than by enunciating the practical relations of heat and light in gas-flames.

The Municipal Council of Paris have not yet had enough of the electric light, but, as it appears, they are having too much gaslight to please them. The "Phare" lamps in the Rue du Quatre Septembre are to be curtailed, the illumination of the street by those improved burners being considered excessive, and consequently one-half their number will be dispensed with. Until the introduction of the electric light in the streets, such excessive illumination was not considered necessary; but when it was so much admired, and Gas Companies, in order to keep in the fashion, set themselves to meet the newly-discovered want, it was not long before first London, and now Paris, awoke to the fact that the necessity did not after all exist; and, strangely enough, it is gas which is always suppressed first. Sufficient, however, has been done in both capitals to prove that when high illumination is required the electric light will not be quite alone in the field, and with this assurance the advocates of gas lighting on a grand scale will probably rest contented.

We shall probably for some years to come hear as much about Mr. Thomas Alva Edison and his wonderful talents and consequent rise in life, as in former times was repeated about Watt and the tea-kettle. The American inventor's habits, his candour to strangers, his laboratory, and the marvellous work he does in it, form a never-failing theme for the padding of newspaper columns and the pages of popular magazines. Recently it has been more the grand discovery of gold where nobody thought of looking for it, or rather where everybody had overlooked it, than the making of untold wealth out of the ruin of the Gas Companies, where everybody thought it might be done, which serves to rivet the attention of the public upon the proceedings of this extraordinary man. For an extraordinary man Mr. Edison most decidedly is, if only for the ease with which, without any apparent effort of his own, he keeps all the civilized world looking at him. We do not begrudge Mr. Edison any of his notoriety. He has earned it, and we hope will continue to enjoy it for some years to come, for there are many dark places in the world which he can illuminate with the light of his genius and perseverance, and still leave gas people to earn their pittances by following their profession, and to train their sons to do likewise.

Water and Sanitary Notes.

THE views of the Home Secretary on the question of the Metropolitan Water Supply were freely expressed on Friday afternoon to a deputation from the Metropolitan Board of Works, headed by the Chairman, Sir James M'Garel Hogg, M.P. The Bill of the late Government was declared by Sir William Harcourt to be "dead," and he knew of no intention to revive it. But certain agreements which had been provisionally entered into were not altogether extinct, and Sir William found that opinion was very much divided as to whether those agreements were favourable to the interests of the public or not. From his own point of view, it seemed that the public were not at present in a position to form a judgment as to the value of these agreements. An examination of the scheme of purchase was, therefore, necessary. The agreements would be laid before Parliament, and Sir William, together with Mr. Dodson, would bring the subject under the consideration of the Cabinet. His own idea was that a Select Committee should investigate the matter, so as to discover whether the terms of purchase were fair or otherwise. In his remarks, the Home Secretary betrayed an impression that the terms of purchase were too high, and that it would be for the public to consider whether they could do better for themselves in another way. "The Water Companies have no "monopoly in the supply of London," said Sir W. Harcourt; and the deputation cheered the statement. "No doubt," continued the Home Secretary, "there may be difficulties and incon-"venience in introducing a new supply, but these may be over-"come." Concerning the dangers of delay, Sir William was not alarmed, and the assessment cry did not distress his nerves. On this point the new Home Secretary has shown considerable discernment from the first. As to the question of monopoly and a new supply, Sir William was more brilliant than profound. But he pleased the deputation amazingly, saying, among other things, that "the Government would look to the Metropolitan "Board as one of the most powerful engines for assisting "them" in getting out of any difficulty in devising an alternative to that of purchase. One declaration made by Sir W. Harcourt in reference to the purchase calls for special notice. "If the terms are reasonable," said the Home Secretary, "then we have to consider whether the thing is worth buying "upon reasonable terms." This extraordinary policy, we apprehend, is not likely to be approved of, either in the Cabinet or by Parliament. Sir W. Harcourt speaks like Cæsar, but he is not Cæsar.

In the course of his address to the deputation from the Metropolitan Board, Sir W. Harcourt referred to the communications which the Government had received from the City Authorities on the subject of the Water Supply, and he remarked that these were very much in accordance with the statement made on behalf of the Board by Sir J. M'Garel Hogg. On this point we may observe that the Commissioners of Sewers, after their somewhat inglorious interview with the Home Secretary a week or two ago, proceeded to consider what they might best propose with regard to the Water Question. Having done so, they quickly arrived at the conclusion that the Bill of Sir Richard Cross is worth looking into, and that it had better go before a Select Committee. A large majority of the Court of Common Council thought so too, and it was decided that the civic authorities should co-operate on that line of policy. At the same time certain other things are asked for, and the question is raised whether the cost of purchasing the existing works "might not be more advantageously applied in procuring a "new and better supply." As usual, a desire is expressed that the Companies shall be prevented from making any progress, or in any way improving their position, while the subject is being investigated. The attention of the Home Secretary is also directed "to the need of re-considering and revising "the basis of the water-rate." There is a call for a "re-"adjustment," which appears to mean that offices shall pay less, and dwellings no more than they do at present.

In the House of Commons last evening, in reply to questions from Mr. Brand and Mr. Ritchie on the subject of the Metro-

politan Water Supply, the Home Secretary made a prolonged statement, informing the House, in reference to the terms of purchase, that the Government would appoint a Select Committee to "inquire into the real character of the agreements, "and their actual relation to the value of the property to be "acquired under them." The inquiry into the agreements, it was considered, could "be brought into a moderate compass, "so as to be disposed of in the present session." On the other hand, "an investigation of the whole question of water supply "would evidently extend to far wider limits." In his subsequent remarks, Sir William seemed rather to enlarge the proposed scope of the inquiry, especially when he included a consideration of "whether it might not be more desirable to obtain "from other sources a better supply at a cheaper rate." He expressed his satisfaction at the assistance which would be rendered by the Corporation and the Metropolitan Board, especially in the absence of "a Central Metropolitan Authority "for the general government of London." The Committee would be moved for in a day or two.

Mr. Charles Ekin, of Bath, has written a little work on "Potable Water."* The author's object is to promulgate what he considers to be sound views on the question of water analysis. He contends that the Rivers Pollution Commissioners have fallen into a fatal error by judging chiefly of the wholesomeness of water from the amount of organic matter it contains, quite irrespective of the nature and origin of the organic matter in question. Hence, Mr. Ekin asserts that many water supplies of undoubted wholesomeness have been condemned, whereas others of more than doubtful purity have been classed as unpolluted. All the existing methods of analysis fail to distinguish satisfactorily between organic matter of a vegetable character, and that which is animal. As the latter is dangerous, while the former is harmless, the lack of the requisite distinction is declared to be both "unscientific "and misleading." Concerning the presence of nitrates, while admitting these salts to be harmless, Mr. Ekin still considers that if they exist to any large extent in a sample of water, they indicate a dangerous degree of pollution. Nitrogen as nitrites he considers should always be absent from a good water, and he is not altogether prepared to give up this rule even in the case of deep chalk wells. Mr. Ekin claims to know something of his subject by the fact that he has analyzed nearly two thousand samples of water, and that he has enjoyed the good fortune to practise as an analyst in a district where, within a radius of thirty miles, every geological formation, from the chalk down to the Silurian, is represented, thus giving him considerable experience as to the diversities in the composition of water taken from various strata. While stricter than Dr. Frankland on some points, he is willing to admit "the self-purifying power" of rivers, and the destruction of poisonous germs. "Of course," says Mr. Ekin, "there are "many rivers so impure as to be entirely unfit for human "consumption; but there is no evidence that the health of towns "that take in turn their water supply from such rivers as the "Trent and Thames, and again pour their sewage into them, is "injuriously affected by the use of such water, however repug-"nant and nasty the idea must be of drinking water that has "been mixed with sewage, and however desirable it may be to "obtain water, if possible, from purer sources." We would observe that the actual discharge of sewage into the Thames above the intakes of the London Water Companies is now becoming so rare and remote that even the sentimental objection is fast losing its force. Mr. Ekin's book is clever and suggestive, and his practical experience gives it weight.

A confused kind of discussion has arisen in the daily papers as to the nature and origin of sundry disagreeable odours prevalent in some of the leading West-end thoroughfares. Sewers, drains, dust-bins, gas-mains, and roadways, have all come under suspicion, the attack being directed chiefly against the sewers and the roads, the latter being deemed a probable cause of offence, owing to the heat of the weather, and the foulness of their surface. One gentleman who writes to *The Times* declares that he can smell the odour "four miles" off. Mr. W. H. Teulon says that when he leaves the West-end and enters St. Pancras, Holborn, or the City, the effect "is "almost like a change into country air." Remembering what dismal things have lately been said as to house drainage in Kensington, we are led to conclude that the West-end is not entirely a happy place.

The annual report of the Metropolitan Board, recently presented, concludes with a warning statement that London must not again expect to have a consolidated rate of less than sixpence in the pound. Were it not for the coal and wine duties, the rate would be nearly threepence in the pound more than it is; and as the Board are only empowered to receive aid from that source up to July, 1888, the outlook is somewhat dark, unless an extension of those duties in favour of the Board can be obtained. "The increasing wants of the "growing population of the Metropolis," it is stated, "neces-"sarily bring with them increased expenditure and increased "financial responsibilities."

It is to be hoped that the Metropolitan Board will be able and willing to carry out the wishes of the Kyrle Society and sundry other friends of the poor, by acquiring the gardens of Lincoln's-Inn-Fields, and throwing them open to the public, so that the hapless children who are packed away in the neighbouring alleys may no longer be compelled to seek their pleasure in the gutter, while seven acres of green earth, with flowering shrubs and graceful trees, are locked up for the exclusive benefit of a chosen few. In the interests of health and civilization, it is time the gates were opened. Yet many difficulties are started, and two deputations went before the Metropolitan Board last Friday to present memorials deprecating any interference with the existing arrangements.

The Sanitary Institute of Great Britain has just held its annual meeting. Dr. B. W. Richardson, F.R.S., who presided, complained that they had been "sorely disappointed" by the supineness of the late Government. Great hopes had been excited by "the voice then supreme in command," which declared solemnly and loudly "*Sanitas sanitatum, omnia sanitas.*" But "the years had passed," and there was nothing save the voice. Expectation was now fixed on the new Government; but a new basis was required, such as would be afforded by a responsible Minister of Health presiding over a department comprehending all those sanitary functions which are now scattered and divided between the Local Government Board, the Home Office, the Privy Council, and the General Register Office. "A new Government, strong, ambitious, and powerful," is invited to undertake this task.

APPARATUS FOR PUMPING GAS FROM LINACRE TO LIVERPOOL.

With this week's number of the JOURNAL is given a double-page plate showing the arrangement of the engine and exhauster house, with boiler-house attached; also a plan, side elevation, and end elevation of one of the four sets of engines and exhausters employed for pumping gas from Linacre to Liverpool. As already explained to our readers, this apparatus was designed by Mr. William King, C.E., the Engineer of the Liverpool United Gaslight Company, and constructed by Messrs. Gwynne and Co., of Essex Street Works, London.

Two pairs of engines and exhausters were put in hand in April, 1878, the other two are at present being erected. Each of the engines —of the non-condensing single cylinder type—has a crank-shaft with double bearings, to which are attached direct two 63,000 cubic feet per hour exhausters. By this arrangement a steady vacuum and pressure are maintained; in fact, to quote Mr. King's own words, "the machinery has worked very satisfactorily, the gauge on the outlet hardly showing any perceptible oscillation, and has in all respects accomplished the purpose for which it was designed."

Messrs. Gwynne and Co. write us: "In addition to the non-fluctuating steady exhauster, erected by us at Linacre, we have at work at the Bromley station of The Gaslight and Coke Company a pair of 105,000 feet exhausters with engines on our new patent, and after severe trials we found that the steady gauge was maintained at any variety of pressure. We have also erected one for the European Gas Company, under Mr. Bates, their Engineer, at Soubeville, near Rouen, and the gas is drawn through a main of about 2 miles in length, from which numerous factories are supplied, taking their supply direct from the pumping main. We have also supplied this apparatus to the Salford Corporation Gas-Works and the Hackney station of The Gaslight and Coke Company—a pair of 63,000 feet exhausters and engine, capable of passing 126,000 cubic feet of gas per hour. Some of these have been at work a considerable time, and have given the most satisfactory results."

INSTITUTION OF CIVIL ENGINEERS.—The concluding meeting of the Institution for the session 1879-80 was held on Tuesday last—Mr. W. H. Barlow, F.R.S., the President, in the chair. During the past session there has been an effective increase of 78 Members, 80 Associate Members, 1 Associate, 1 Honorary Member, and 79 Students; bringing up the numbers of these several classes to 1218, 1301, 583, 18, and 663 respectively, or a gross total of 3783, and representing an increase in the past twelve months at the rate of 5 per cent.

URQUHART'S PATENT DRY GAS-METER.—In the "Applications for Letters Patent" published in last JOURNAL was one—No. 2001, dated May 15—by Mr. J. Urquhart, of the Gas-Meter Testing Office, Manchester, for "Improvements in Meters or Apparatus employed in Measuring the Flow of Fluids." Part of this invention, we understand, consists in substituting flexible metal for leather measuring chambers in dry gas-meters, thus making what has long been a desideratum—an all-metal dry meter. The advantages claimed in consequence are far greater durability and more permanent correctness in registration. The meter is said to work at 2-10ths pressure. Mr. Urquhart was the inventor of the "Reliance" wet meter, adopted by the Manchester Corporation Gas Committee about three years ago, and now being manufactured by the Gas-Meter Company, Limited.

* "Potable Water: How to Form a Judgment on the Suitableness of Water for Drinking Purposes," addressed to Medical Officers of Health and Sanitary Authorities, &c., by Charles Ekin, F.C.S. London: J. and A. Churchill.

Communicated Articles.

THE ACTION OF THE BLOWPIPE CONSIDERED WITH REFERENCE TO THE PRINCIPLES OF GAS ILLUMINATION.

By Mr. R. H. Patterson, F.S.S.

The action of the blowpipe may, at first sight, appear to have very little practical interest to members of the gas profession; but it seems to me that a correct knowledge or interpretation of its phenomena lies at the very root of a correct ascertainment of the principles of gas illumination. I have already treated of the effects of *heating* both the gas and the air supplied to gas-flames; but a still more important matter (inasmuch as it is a universal condition of ordinary gas illumination) is the varying effects of the air supply, at the ordinary temperature, upon the illuminating power of gas-flames.

An "excessive" air supply, however occasioned, has long been recognized as injurious to the light of gas-flames; and it is to this cause that the manifestly bad effects of "pressure" upon illuminating power have been assigned. I have seen it lately denied that pressure in the gas is injurious to illuminating power; but this allegation is manifestly owing to a misconception on the part of the sceptic. It is quite true that a certain amount of gas pressure is not only useful but indispensable in the gas consumed in "naked" or "flat-flame" burners, such as bat's-wings and fishtails. That is because, without pressure, these burners cannot produce their appropriate flames; some pressure is necessary to compel the gas to expand and present a requisite surface of flame to the air. Without this amount of pressure, both a bat's-wing and a fishtail will give only a tall and shapeless column of flame, which smokes from lack of air supply. Pressure, then, is indispensable for such burners. But the question is, firstly, is it not the case that a bat's-wing or fishtail which produces its appropriate shape and size of flame with little pressure is, *cæteris paribus*, a better burner than one which requires more pressure to develop its proper flame? Secondly, does not a burner like the Argand, which does not require any pressure, give a higher illuminating power than any burner which requires pressure? To prevent misunderstanding, I may say that I here speak of single burners; *combinations* of burners depend for their results not merely upon the excellence of the individual burners, but equally upon the mode of combination. And, so speaking, I maintain that, *cæteris paribus*, of flat-flame burners that one is best which requires the least amount of pressure; and, further, that no single burner which requires pressure can surpass, or even equal, a burner like the Argand, which needs no pressure. But next, assuming the injurious effect of pressure upon illuminating power, how is it that this injurious effect is produced? Granting the fact (as probably all your readers will do), what is the correct explanation of it? This is the question with which I desire to deal in the present paper.

First, as to the *manifest* effects of pressure; that is to say, those as to which there is no question. Coal gas, on the average, has a specific gravity of about ·450 compared with air as 1. In other words, it is half as light as the atmosphere; and accordingly it will ascend from the burner of its own accord, just as oil rises up through water. And its velocity of ascension may be roughly, or in a manner suitable enough for popular illustration, computed by placing in a tube of water a coloured oil or other liquid having only one-half the specific gravity of water, and observing its velocity or rate of ascension to the top of the tube. Thus, in the Argand, where the proper desired flame is simply perpendicular, the gas of its own accord ascends with sufficient velocity, so that no pressure is needed. And it is universally acknowledged that, in the Argand, *any* application of pressure to the gas is disadvantageous to the illuminating power. I may remark, in passing, that, were some amount of pressure unavoidable with the Argand (which, thanks to Mr. Sugg's arrangements in his "London" Argands, is not the case), the bad effects of this pressure might be, to a considerable extent, removed by altering the height and width of the chimney. But, taking Argands as at present used, there is no fact in gas illumination more generally acknowledged than that pressure is damaging to the illuminating power of these burners.

The best kind of burner for showing the effects of pressure is the simple jet-burner; and any one who has tried it knows that, as the pressure is increased, the light is diminished, and indeed may be all but destroyed. What is *seen* is that the jet of flame swirls and roars, losing its smoothness of surface, and it also loses a great portion of its illuminating power. Another of the *manifest* effects of pressure is that the gas-flame is brought into increased contact with the air. Partly, perhaps—and in the case of "flat-flames" certainly—this is because the gas, owing to its increased velocity of issue, is driven to a greater distance, whether perpendicularly or laterally, from the burner, presenting a larger surface of flame to the air; and in all cases because the increased rush of gas tends to draw in upon the flame a greater draught of air; just as a current through a pool, in proportion to its velocity, produces eddies, and draws in upon itself the otherwise quiescent water. Indeed, the steam-jet exhauster furnishes the best of all illustrations; the rapid current of steam imparting its own motion to the surrounding gas, and drawing the gas along with it.

Thus the manifest, direct, and acknowledged effects of pressure are that, whether by enlarging the flame or by increasing the draught upon it, the burning gas is brought more in contact with air. But the important and, as it seems to me, still undetermined question, is, How or in what manner does this increased air supply to the flame produce a diminution of its illuminating power?

The long-established and, so far as I know, the universally received explanation is that, in consequence of this excessive air supply, the gas, or the illuminating portion of its substance, is too rapidly consumed. The writers on this subject—Dr. Letheby and many others—define the process as "over-combustion," or "over-oxidation." Roscoe, adopting and scientifically explaining the universal opinion, describes the phenomenon thus: In the process of combustion the solid carbon particles of the olefiant part of the gas are separated out of it, and burn separately, producing the luminous part of the flame; but when there is an excess of air these solid particles are consumed "at once"—converted into carbonic acid without any intervening stage of combustion, and therefore without developing their ordinary luminosity.

During my investigations ten years ago, a different explanation of this phenomenon suggested itself to me. But, in the first place, let us see how far the above doctrine, as expressed by Roscoe, is undoubtedly correct. Any one who considers a gas-flame must agree with Roscoe that there is, more or less, a separating-out of the solid particles of carbon; although whether he is right in confining this separation to the olefiant gas, and excluding the carbon in the marsh gas, might be questioned. But it is a point of merely abstract interest, the olefiant gas constituting the only really luminous part of the flame. And that this portion does not burn along with the hydrogen, or while incorporated with it, seems visible to the eye; the luminous part of the flame holding a separate place above the blue and non-illuminating part. There cannot be a doubt, then, that a process of "dissociation" takes place, the high temperature of the burning gas breaking up the chemical compounds of the olefiant gas (C_2H_4), and the hydrogen burning first, in the lower part of the flame. There is a much more striking instance of such dissociation under the influence of a high heat—viz., in the case of carbonic acid, which is usually spoken of as a non-combustion-supporting and totally incombustible substance. Even with sulphur and phosphorus, carbonic acid does not support combustion, maintaining its integrity as a wholly incombustible substance; but certain metals, such as magnesium and potassium, when heated in carbonic acid, *burn in it*. The heat, combined with the extraordinary attraction of these metals for oxygen, breaks up the carbonic acid into carbon and oxygen, whereupon the oxygen goes to support, or rather to produce the combustion of the metals (burning with them and forming oxides), while the carbon is liberated. Accordingly, and also from the spectacle presented by a gas-flame, there is no reason to doubt that the carbon is separated out of the olefiant gas in a solid form (in consequence of the hydrogen part of the compound having previously been burnt), and burns separately in the upper and white portion of the flame.

But is the other, and, as regards the present question, more important part of Roscoe's doctrine or explanation (which is the ordinary or universal one) equally correct? Is it true that the decrease or destruction of luminosity from an excessive air supply is owing to the carbon particles being so suddenly consumed that they are "at once" converted into carbonic acid—the ordinary product of combustion? Were this statement taken literally, the inference would be that there would be no light at all. But, despite the word "at once," the fair meaning is that the carbon particles are in a state of combustion *for a shorter time than usual*, and that, therefore, they give out less light. The explanation is not a readily intelligible one. When the carbon is burnt in a shorter time, must not the intensity of combustion be greater? The result which one would expect from a briefer time of combustion of an equal quantity of illuminating gas would be a hotter, smaller, and *brighter* flame. The illuminating substance is admittedly as completely consumed in this case as in ordinary gas consumption; and it is difficult to conceive that the rapidity of consumption, however great, can suffice to take from the gas its illuminating property. If you burn a pound of coal in two minutes, will it not give out as much heat as if it were consumed in four minutes? Or if you burn gunpowder, or other such like explosive substances, however rapidly, can you thereby (by converting it "at once" into the products of combustion) lessen or destroy its explosive power? Both these illustrative cases suggest a different result from that stated by Roscoe relative to the rapid combustion of gas. Gunpowder may be consumed so slowly (by damping it) that it virtually loses its explosive power, and the more rapidly it is consumed the greater is the explosive force which it generates. Also, as regards coal, if it be consumed slowly, it emits little light; whereas its luminosity is increased in proportion to the rapidity with which it is consumed. In fact, the more rapidly a body is burnt the higher necessarily is its temperature of combustion; and the higher the temperature of an illuminating substance—in other words, the higher its temperature of combustion—the greater is the amount of light which it emits.

If, then, or in so far as, these considerations are well founded, one would expect that the effect of a more rapid combustion of the gas, owing to an increased air supply, would be, not a destruction of light, but (although with a smaller flame) an increased intensity of the light. Yet we know as a fact that this is not the case. The light is destroyed, be the cause or explanation what it may.

It will be observed that, in the above considerations, it is assumed that the more rapid combustion is attended, and indeed produced by a greater intensity of combustion—in other words, a hotter flame. And what is here assumed is accepted as a fact by chemists and men of science generally. The commingling of air with a gas-flame in the blowpipe is universally held to produce a higher temperature in the flame. And there can be no question that gas used with the blowpipe melts substances which remain unfused when exposed to an ordinary gas-flame.

In his able lecture "On the Combustion of Gas for Economic Purposes," delivered before the British Association of Gas Managers in

1866, Dr. Letheby was stating the received opinion, illustrated by well-known or fully-acknowledged facts, when he said:

A pure white light is never attained but by the intense ignition of solid or molten matter. . . . In the case of coal gas the light is never pure unless it is intensified by very energetic combustion. If the combustion of a gas-flame is intensified by a proper supply of air, the temperature of the ignited carbon increases, and the light becomes purer and purer—giving a spectrum like that of solar light, with all tints of the rainbow.

And now I will briefly describe the contrivances which are used for increasing, or rather I should say for fully developing the temperature of burning gas. I have shown you that the light of a flame depends on the presence of ignited carbon; if, therefore, by any contrivance we can at once burn this carbon, and not permit it to stand as it were idle in an ignited condition, the temperature must be considerably increased. This is the principle concerned in all the contrivances for developing the heat of gas.

One of the simplest means of accomplishing this is to mix a sufficient quantity of air with the gas before it reaches the place of combustion; and this is easily done by putting a cap of wire gauze upon the chimney of an Argand burner, and setting fire to the gas above it. The effect of this arrangement is that as the gas passes from the burner to the top of the chimney, it draws in a quantity of atmospheric air, which freely mixes with it and burns the solid particles. The same is the case with the burner of Bunsen, which I have already described; and you will note how strongly it ignites this platinum crucible.

But we shall find that a still higher temperature is obtained by blowing air into a large volume of flame. This is the plan adopted by Mr. Herapath in the blowpipe jet. Observe how intensely it ignites a mass of platinum wire, &c., &c.

The sequence of ideas, or of statements, is here very singular. It is only by a high temperature of combustion that white or perfect light is obtainable. This is obtainable by increasing the air supply. Next, says Dr. Letheby, I shall show you how, in this way, a high intensity of combustion is obtained. Nevertheless these processes (the blowpipe and Bunsen burner), instead of giving greater light, give none at all! How does this happen?

The power of the blowpipe to melt metals unfusable by the simple gas-flame is beyond question. Hence it is a natural inference that the commixture of air or an extraordinary air supply, while consuming the gas more rapidly, consumes it also at a higher temperature. But is this a necessary and certain inference from the facts? That the heat of the flame *as applied to the metal* is increased is certain; but it does not follow that the heat of *the flame as a whole*—the total heat of the gas combustion—is augmented. The effect, or purpose of the blowpipe is to greatly *reduce* the ordinary size of the gas-flame, and to concentrate it upon a small point of the substance operated on. Hence the total heat of the gas combustion may be no greater than in the ordinary flame—indeed, it might be considerably less; in other words, the gas might really be consumed at a lower temperature, and yet the same high melting power might be obtained. There may be no increase of temperature throughout the flame, but simply a concentration of the heat. For example, if the metal of a cannon ball be flattened and extended into a disc, then, although projected with the same force, it will strike harmlessly against a substance (say the side of a ship) which would be easily penetrated by the ball itself—that is, by the same weight of metal concentrated, spherically or still better conically, so as to bring the whole projectile force against the smallest possible portion of the surface to be penetrated. This is just what the blowpipe does. It reduces and concentrates the flame into a pencil of fire, bringing its whole power to bear upon a mere point of the substance to be melted. Thus the operating heat is greater, while the resisting portion of the substance is less than occurs when the simple gas-flame is employed. Accordingly, as it seems to me, the vastly increased melting power of the gas-flame when applied by the blowpipe does not *necessarily* prove that the gas is being consumed at a higher temperature. It may be so; but there is no intellectual necessity to believe it. On the contrary, it seems to me that, so far as the results show, there might actually be a decrease in the general or total heat of the flame; the vast melting power (or the degree and effects of the *applied* heat) being due to a concentration of the heat of the flame, and its application to a very small part of the metal operated upon.

In fact, is not the action of the blowpipe similar (not wholly, but to a large extent) to the action of the common glass lens, whereby the sun's rays are made to ignite paper or wood? If so, then the blowpipe does not raise the temperature of the burning gas, but simply applies it more effectually. Further, if the power of the blowpipe be simply due to its concentrating action, for all we know the gas combustion may actually take place at a lower temperature than usual; the decrease being far more than compensated by the concentration and its result—viz., the smallness of the surface acted upon.

The Bunsen burner is another apparatus quoted to show that the temperature of gas combustion is raised by commingling air with the flame. But the blowpipe is so far the superior apparatus that I have preferred to deal with it; and if, as I have suggested, the *facts* of the blowpipe do not prove a higher gas combustion, and even admit of the possibility of a lower temperature than in the ordinary flame, the Bunsen burner need not demand much consideration. Moreover, it is a fact that at times I have succeeded in melting a piece of platinum wire in an ordinary gas-flame, yet have never been able to do so in the flame of a Bunsen burner. Other experimenters may have obtained different results; but certainly such is what I have found. This fact, as I found it, is quite discordant with the established opinion that the flame of the Bunsen burner is much hotter than that of any ordinary gas-flame. Of course there may have been something exceptional in my experiments, although I am not aware of it; but such testings are easily made by any one; and perhaps some of the readers of the JOURNAL will do so.

Now, if my own experience in this matter be supported by that of others—as it will be unless (unknown to me) there was something exceptional in it—it makes an end altogether of the superiority of temperature claimed for the Bunsen burner. There is plenty of reason why the Bunsen burner should be so highly valued irrespective of any (real or supposed) superiority in the temperature of its flame. In the first place, the flame is concentrated—the gas burns within less space than an ordinary gas-flame; and the great advantage of this concentration has already been shown in the case of the blowpipe. Secondly, the Bunsen burner is the cleanest and handiest kind of flame or fire which can be used in the laboratory. Thirdly, it does not smoke, and deposits no soot on the substance operated upon. And this really gives to it a greater heating power. An ordinary gas-flame quickly covers the (colder) substance against which it is directed with a deposit of soot, which at once impairs and gradually destroys its own power as a heating or fusing agent. Hence, even if (as I believe) the Bunsen flame is not superior in temperature to the ordinary gas-flame, it will *appear* to possess that superiority because its heat is *entirely* available, whereas in actual operation that of the gas-flame is not.

May it not be, then, that the blowpipe-flame, likewise, has no superior temperature; but, like the Bunsen burner (although on a greater scale), only appears to possess it, owing to the more efficient manner in which the heat is applied?

I have but a few words more to say, in which, before endeavouring to draw conclusions, I must first add a little to the preceding facts and considerations, relative to the varying and somewhat puzzling effects of the air supply (at the ordinary temperature) upon the illuminating power of gas.

THE REMUNERATION OF GAS MANAGERS.

By Mr. W. WHITE, of Abersychan.

Almost every profession, trade, or calling has some peculiarity connected with it which defies explanation; and it frequently happens that if attempts be made to ameliorate the condition of those who are unable to understand, with any degree of satisfaction to themselves, the anomalous position in which they are placed in consequence of such peculiarity, they are peremptorily regarded as the irrepressible outgrowth of discontent. In commenting upon the above subject, it is not intended to follow the lucubrations which were served up for the delectation of gas managers a short time since.

To some minds, doubtless, it is difficult to approve of the lugubrious ideas of those who argue that the status of the gas manager can be raised by a more complete theoretical training and extended technical education than that to which he has hitherto been accustomed. Upon this latter consideration there seems to be ample ground for a wide divergence of opinion. Many points of importance are involved in the problem; and that the remuneration doled out to many in the profession to-day is ridiculously inadequate for the services of a highly-trained gas manager, is as palpable as the fact is monstrous. It appears that much is involved in taking the first step towards improvement, and while not declaring that the educational movement should strike upwards in the way of gas directors and gas committeemen, the fact cannot be ignored that amongst those gentlemen a change of opinion on this subject is highly desirable. Advertisements (with their sanction) often appear in newspapers, offering terms and conditions of engagement which are, to say the least of them, a reflection upon the respectability and utility of the gas profession. Can it be expected that really good men will apply for such appointments, or that such announcements offer encouragement for young men to qualify themselves for the higher grades of the profession? It is idle to complain of the non-progressiveness of the science and practice of gas manufacture, so long as the legitimate incentive to the exercise of genius be wanting.

While admitting that gas directors and committeemen are unable to do everything required to help on improvements in gas manufacture, it cannot be denied that in too many instances the remuneration of gas managers is not only not sufficient to enable the latter to enjoy repose and comfort, and afford them an opportunity of exerting themselves for improvement, but is so narrowed as to reduce life to a perpetual struggle for existence. Many gas managers have but little comfort to glean from a comparison of their own position with that of others who are not connected with the gas industry. The records of many limited liability companies prove that in management the directors of such concerns are liberal to those who have a responsible connection with them. This is also frequently the case notwithstanding the shareholders are not only not reaping benefit upon the capital invested, but have the disagreeable assurance conveyed to them in the statements of account that their principal, too, is fast sinking away. Very few readers of the JOURNAL there are who will be unable to call to mind many such instances.

The members of the gas profession, on the other hand, are, as a body, miserably underpaid; although, forsooth, they represent the genius and active principle of one of the most flourishing industries in the kingdom. It may with safety be averred that were a man of ordinary ability to transfer his interest to any undertaking other than gas management, and pay the shareholders one-half as much dividend as may be realized from a gas supply, the manager of the concern would in all probability receive for his services double, if not treble the remuneration that would be tolerated by gas directors or committeemen. Some advertisers appear to have regard for the sensitiveness of their victims, and allow applicants to name their own salary. There is one redeeming feature in such cases—there is either a sense of shame which the advertisers cherish; or, on the other hand, motives of economy prevail, and the lowest offer is regarded with favour. It would be interesting to the curiously minded to learn how some of these snug little appointments are filled up, and the amount of remuneration which follows the fulfilment of the

duties of the post. Over these dark recesses, luckily, the veil of secrecy is drawn, and the public eye is saved from beholding a picture more calculated to fill the mind with serious and unhappy reflections upon the case than with any feelings of satisfaction which should accompany the issue of such struggles in life.

Men who are entrusted with onerous duties to fulfil, and with grave responsibilities resting upon them, should, in all conscience, receive adequate remuneration for the faithful discharge of them. The ghost of poverty should not be the constant companion of any gas manager, so long as he does his duty to his employers, and is enabled to bring his abilities to bear for their benefit. All right-minded men have a little ambition, and when a man ought to be able to hold his own amongst his compeers in life, he deserves to be dealt with as liberally as others who cannot have more claim to just recompense for the faithful discharge of responsible duties than the gas manager, no matter what his position may be. Generally, it may be said that the gas manager of to-day is intelligent, painstaking, and frugal; and yet he is about the most underpaid of professional men in the United Kingdom.

Correspondence.

[*We do not hold ourselves responsible for the opinions expressed by Correspondents.*]

THE BRITISH ASSOCIATION OF GAS MANAGERS.

SIR,—In the course of a few days the great event of the year—in the gas world—will take place. The British Association of Gas Managers will hold its annual meeting; papers will be read, addresses given, opinions interchanged, and it may reasonably be expected that much good will result. But whilst so much may be said, it must be generally admitted that the scope of the Association is at present far too limited. As now constituted, any one with authority to append the mystic words "Manager" or "Secretary" to his name may become a member, and partake of its benefits, no matter what his attainments in the profession may be, or what the interest he takes in its advancement. But, without that qualification, though his experience may be wide and varied, and his knowledge extensive, the unfortunate assistant must for ever remain an unconsidered outsider, with no *locus standi* whatever. And yet it is this latter class that the advantages of the Association would most beneficially affect. It is to the present assistants we must look for the future managers and engineers; and in proportion to the technical education and training they receive will accrue the future advancement of the science of gas engineering. The great need for scientific and technical education is apparent to any one who considers the hap-hazard arrangements which too often obtain in even well-conducted gas-works; and its urgency was acknowledged in a long correspondence in the JOURNAL during the latter half of the year 1878. At the last meeting of the Association attention was called to the question by Mr. Warner, in his presidential address; but no legislation followed. My object in writing this letter is to draw attention once more to the position of persons occupying responsible positions in gas-works, who are neither managers nor secretaries (but whose interest in the profession is excelled by neither); and to ask that another meeting may not be allowed to pass by without something having been done on their behalf.

There should be no difficulty in framing a scheme for admitting such persons to the benefits of the Association, as associates. I would propose that they receive the Transactions of the Association, but do not attend its meetings; but that they contribute papers on subjects chosen by the Committee, for the best of which prizes should be given, the subscriptions of the associates furnishing ample means for this latter purpose. Provision might also be made for associates becoming members as the highest distinction attainable.

Trusting that something will be done to improve the lot of my fellows, and that speedily, I beg to subscribe myself

May 26, 1880. AN ASSISTANT.

MR. PATTERSON ON THE AIR SUPPLY TO STREET-LAMPS.

SIR,—In the third part of Mr. Patterson's article on the "Effect of Temperature in the Gas and Air Supply upon the Illuminating Power of Gas-Flames," he refers, as an application of very recent date (except in the case of oil-lamps), to the method of making use of the natural currents of gas and heated air, by feeding the cold air through the upper part of the lantern, and down its sides to the flame, without impinging upon the upward current of the products of combustion, thus avoiding the necessity for an opening at the bottom of the lantern; whereas all street-lamps were closed at the bottom previous to the introduction of the new lighting torch, and are still practically so, taking in all the air through the top of the lamp in accordance with the principle described by Mr. Patterson.

May 28, 1880. PRACTICAL.

MR. SUGG AND THE HOLLOW-TOP BURNER, ETC.

SIR,—When I intimated to your readers that I should not again intrude on your space anent this controversy, I had not the remotest idea that Mr. Bray was going to indulge in such a Parthian shot as the revivification of the controversy on "low-pressure burners," which was thoroughly thrashed out in the pages of the JOURNAL and several other papers in March, 1879. Mr. Bray then invented a system of manifolding his letters, so that, like the army of the Grand Duke of Seidlitz von Stinkingen, in Tom Taylor's play, they did duty inseveral places at once.

In his letter of the 8th of March, 1879, which appeared in page 359 of the JOURNAL for that month, and in the *Journal of the Society of Arts*, he acknowledges my title to be the inventor of the hollow-top steatite burner, for he says, "If Mr. Sugg had simply claimed in his original statement the invention of the hollow-top steatite burner, my first letter [to the *Journal of the Society of Arts* denying my title] would not have been penned." It is true that having made this frank admission he feels called upon to say something pleasant afterwards, and he continues, that "to call this invention is playing with language." He, however, forgot to say that he himself had been "playing with language" to exactly the same tune when he rushed into the Patent Office, and declared himself the true inventor of the "hollow-top burner," rechristened the "slit union," made in "adamas," rechristened "enamel." My invention having the precedence of his by some years, made it awkward for his would-be invention; hence, doubtless, the expression above quoted. "The grapes were sour."

The burners shown in section in your last number are *metal* burners (Wadsworth's patent), and, therefore, have nothing to do with the hollow-top steatite burner, which has proved itself so superior to every other burner (of the flat-flame type) as to have decided your correspondent, Mr. Bray, to adopt it as his own, notwithstanding his boast about the number of his "union jets" which are used in England.

In conclusion, I thank you very much, Sir, for your kindness and forbearance during this long and wearisome controversy, and I sincerely hope that it may never be my lot to be led into such another. If at any time I can be of service to your readers in affording them information, I shall always do it with the utmost readiness and pleasure; but of such "horse at the mill," round and round on the same track controversies, in which reiteration takes the place of argument, I'll have no more.

Vincent Works, Westminster, S.W., May 29, 1880. WILLIAM SUGG.

[We can thus congratulate our readers on the close of this controversy.—ED. J. G. L.]

QUANTUM asks—(1) What would be the average discharge, in gallons per hour, of water from a 4-inch cast-iron pipe under the following conditions:—Water to be supplied for 8 hours. The 4-inch cast-iron pipe is 5 yards long, out of a 9-inch main. The pressure at the junction of the main and pipe at the commencement is 150 feet, gradually falling to, and remaining at 84 feet after two hours service? (2) What would be the discharge if the head was 84 feet throughout?

BOX'S IMPROVED STREET-LAMPS.

The above illustration shows a street-lamp glazed according to the invention of Mr. W. W. Box, of the Crayford (Kent) Gas-Works, and which is secured by a patent taken out on the 24th of October last.

The specification of the patent—which is for "Improvements in Securing Glass and other Surfaces in Frames for Lamps, Lanterns, and other Articles and Structures"—states that the object of the invention is to dispense with the use of putty, so that lamps may be repaired by unskilled workmen; and, at the same time, the frames will not be injured by the continued chipping off of the hard putty.

According to one arrangement, the corners of the frame are made with angle pieces, and the base with diagonal pieces extending nearly up to the angle pieces. The glass (cut to the exact size of the frame, as usual) is placed against (or in) the angle pieces; and, to secure the glass, a strip of angled metal is fitted against it; while, to grip the two adjacent plates of glass at one and the same time, the angle strips of metal are held in position by being slipped under a loop or staple at the top of the frame, and by being inserted at the bottom between the diagonal pieces and the angle corner pieces in the space left for their reception. A hooked projection is connected to the angle strips, so as to take hold of and put them into position, and to remove them when required to insert a new pane of glass. The bottom panes are secured by pins inserted in the diagonal pieces, and the panes themselves rest on flanges formed by the base of the diagonal pieces. By taking out the pins the panes can be replaced.

The invention also consists in securing the top glasses or plates by inserting them into grooves or recesses formed for the purpose in the frames, and there securing them by studs or clips, which, when turned in one direction, hold the glass or plates, and when turned in the contrary direction the plates are free to be removed. These clips may be made of soft metal, such as copper, so as to be easily fastened and unfastened as desired. The groove or recess is preferably made with a wire edge and groove, so that the glass rests on the wire, and a space is then formed for the passage of water. The plates can, of course, be glazed or enamelled on the under side when desired, so as to act as reflectors.

REDUCTION IN THE PRICE OF GAS BY THE CRYSTAL PALACE DISTRICT COMPANY.—Notice has been given by the Directors of the Crystal Palace District Gas Company that, from and after Midsummer, the price of gas will be reduced to 3s. 8d. per 1000 feet.

Parliamentary Intelligence.

PRIVATE BILLS RELATING TO GAS, WATER, Etc.

SESSION 1880.

PROGRESS MADE TO SATURDAY, MAY 29.

Title of Bill.		Petition for Bill Presented.	Bill Read the First Time.	Bill Read a Second Time.	Bill Reported.	Bill Read the Third Time.	Bill Received Royal Assent.
Ackworth, Featherstone, Purston, and Sharlston Gas Bill	Lords	..	..	..	..	..	..
Birkenhead Borough Bill " " "	Commons	Feb. 9	Feb. 10	March 8	..	..	..
	Lords	Bill with-	drawn				
	Commons						
British Gaslight Company, Limited (Staffordshire Potteries), Bill	Lords	Feb. 10	Feb. 10	Feb. 23	..	..	..
	Commons	..	..	..	..	..	..
Burton-upon-Trent Corporation Bill	Lords	Comns. Bill	May 27	..	..	..	..
Cardiff Water Bill " "	Commons	Feb. 9	Feb. 10	Feb. 16	March 11	May 25	..
	Lords	Feb. 10	Feb. 10	Feb. 20	March 8	March 11	..
	Commons	Lords Bill.	March 11	..	..	..	..
Chester Gas Bill	Lords	Comns. Bill	March 12	March 19	..	..	..
	Commons	Feb. 9	Feb. 10	Feb. 24	March 2	March 11	..
Cork Gas Bill	Lords	..	..	..	..	..	..
	Commons	Feb. 9	Feb. 10	March 1	..	..	..
Cork Improvement Bill	Lords	..	..	..	..	..	..
	Commons	Feb. 9	Feb. 10	Feb. 16	..	..	..
Dagenham and District Farmers (Optional) Sewage Utilization Bill	Lords	..	..	..	..	..	..
	Commons	Feb. 9	Feb. 10	Feb. 17	..	..	..
Dartford Gas Bill	Lords	..	..	..	..	..	..
	Commons	Feb. 9	Feb. 10	March 15	..	..	..
Dearne Valley Water Bill	Lords	Feb. 10	Feb. 10	Feb. 16	March 16	May 25	..
	Commons	Lords Bill.	May 28	..	..	..	..
Denton and Haughton Gas Bill	Lords	..	..	..	..	..	..
	Commons	Feb. 9	Feb. 10	Feb. 16	March 17	..	..
Doncaster Corporation Water Bill	Lords	Feb. 10	Feb. 10	Feb. 16	March 16	May 25	..
	Commons	Lords Bill.	May 28	..	..	..	..
Eastbourne Gas Bill "	Lords	Comns. Bill	May 27	..	..	..	..
	Commons	Feb. 9	Feb. 10	Feb. 25	March 12	May 25	..
Edinburgh and District Water Bill	Lords	Feb. 10	Feb. 10	Feb. 16	Feb. 26	March 2	..
	Commons	Lords Bill.	March 5	March 15	..	..	..
Exmouth and District Water Bill	Lords	..	..	..	..	..	..
	Commons	Feb. 9	Feb. 10	Feb. 23	..	..	..
Gaslight and Coke, Commercial Gas, and South Metropolitan Gaslight and Coke Companies Bill	Lords	..	..	..	..	..	..
	Commons	Feb. 9	Feb. 10	Feb. 17	..	..	..
Great Yarmouth Water Bill	Lords	..	..	..	..	..	..
	Commons	Feb. 9	Feb. 10	March 1	..	..	..
Hinckley Local Board Gas Bill	Lords	..	..	..	..	..	..
	Commons	Feb. 9	Feb. 10	March 8	..	..	..
Huddersfield Tramways and Improvement Bill	Lords	..	..	..	..	..	..
	Commons	Feb. 9	Feb. 10	Feb. 16	..	..	..
Hull Lighting Bill " "	Lords	..	..	..	..	..	..
	Commons	Feb. 9	Feb. 10	Feb. 16	..	..	..
Hyde Gas Bill	Lords	..	..	..	..	..	..
	Commons	Feb. 9	Feb. 10	Feb. 23	..	..	..
King's Lynn Corporation Bill	Lords	..	..	..	..	..	..
	Commons	Feb. 9	Feb. 10	Feb. 16	..	..	..
Lancashire County Justices (Water, &c.) Bill	Lords	Feb. 10	Feb. 10	Feb. 16	March 11	March 13	..
	Commons	Lords Bill.	March 16	..	..	..	..
Lancaster Corporation Bill	Lords	..	..	..	..	..	..
	Commons	Feb. 9	Feb. 10	Feb. 16	March 12	..	..
Lincoln Gas Bill "	Lords	..	..	..	..	..	..
	Commons	Feb. 9	Feb. 10	March 12	..	..	..
Liverpool Corporation Water Bill	Lords	..	..	..	..	..	..
	Commons	Feb. 9	Feb. 10	Feb. 24	..	..	..
Liverpool United Gas Bill	Lords	Comns. Bill	May 28	..	..	..	..
London Gaslight Company Bill	Commons	Feb. 9	Feb. 10	Feb. 24	March 12	May 27	..
	Lords	..	..	..	..	..	..
Maidstone Gas Bill "	Commons	Feb. 9	Feb. 10	March 1	..	..	..
	Lords	..	..	..	..	..	..
Malton Gas Bill	Commons	Feb. 9	Feb. 10	Feb. 23	..	..	..
	Lords	..	..	..	..	..	..
Oldham Improvement Bill	Commons	Feb. 9	Feb. 10	March 8	..	..	..
	Lords	..	..	..	..	..	..
Phœnix Gaslight and Coke Company Bill	Commons	Feb. 9	Feb. 10	Feb. 16	..	..	..
	Lords	Bill with-	drawn.				
Portmadoc Water Bill "	Commons						
	Lords	Feb. 10	Feb. 10	Feb. 16	..	..	..
Prescot Gas Bill "	Commons	..	..	..	..	..	..
	Lords	Comns. Bill	May 28	..	..	..	..
Preston Improvement Bill	Commons	Feb. 9	Feb. 10	Feb. 23	March 12	May 27	..
	Lords	..	..	..	..	..	..
Rathmines and Rathgar Township (Vartry Water Supply) Bill	Commons	Feb. 9	Feb. 10	Feb. 16	..	..	..
	Lords	Feb. 16	Feb. 16	March 11	..	..	..
Rathmines and Rathgar Township Water Bill	Commons	..	..	..	..	..	..
	Lords	Feb. 10	Feb. 10	Feb. 16	..	..	..
Reading Gas Bill " "	Commons	..	..	..	..	..	..
	Lords	..	..	..	..	..	..
Rochester Corporation Bill	Commons	Feb. 9	Feb. 10	March 1	..	..	..
	Lords	..	..	..	..	..	..
Sea Water Supply to London Bill	Commons	Feb. 9	Feb. 10	Feb. 16	..	..	..
	Lords	Feb. 10	Feb. 10	Feb. 16	March 2.	Preamble	not proved.
Sligo Borough Water Bill	Commons						
	Lords	Feb. 10	Feb. 10	Feb. 16	..	..	..
South Metropolitan Gas Company Bill	Commons	..	..	..	..	..	..
	Lords	..	..	..	..	..	..
Southwark and Vauxhall Water Bill	Commons	Feb. 9	Feb. 10	..	..	..	..
	Lords	..	..	..	..	..	..
Stafford Borough Bill	Commons	Feb. 9	Feb. 10	Feb. 23	..	..	..
	Lords	..	..	..	..	..	..
Wakefield Corporation Water Bill	Commons	Feb. 9	Feb. 10	Feb. 23	March 17	..	..
	Lords	Feb. 10	Feb. 10	Feb. 16	March 11	March 16	..
Wandsworth and Putney Gas Bill	Commons	Lords Bill.	March 18	..	..	..	..
	Lords	..	..	..	..	..	..
Wigan Improvement Bill	Commons	Feb. 9	Feb. 10	March 2	..	..	..
	Lords	..	..	..	..	..	..
Wrexham Water Bill	Commons	Feb. 9	Feb. 10	Feb. 17	..	..	..
	Lords	..	..	..	..	..	..
Yeadon and Guiseley Gas Bill	Commons	Feb. 9	Feb. 10	March 4	..	..	..
	Lords	..	..	..	..	..	..
" "	Commons	Feb. 9	Feb. 10	March 10	..	..	

HOUSE OF LORDS.

MONDAY, MAY 24.

A petition in favour of the Rathmines and Rathgar Township (Vartry Water Supply) Bill, which was also against the Rathmines and Rathgar Township Water Bill, was presented from Ratepayers, owners, &c., of property within the township of Rathmines and Rathgar, and others, in public meeting assembled.

TUESDAY, MAY 25.

The Sligo Borough Water Bill, the Rathmines and Rathgar Township Water Bill, and the Rathmines and Rathgar Township (Vartry Water Supply Bill) were referred to a Select Committee, consisting of Earl Powis, Viscount Gordon, Lord Elgin, Lord Lawrence, and Lord Methuen; to meet on Monday, May 31.

HOUSE OF COMMONS.

FRIDAY, MAY 21.

The petitions against the following Bills have been withdrawn:—Liverpool Corporation Water Bill, of Upper Mersey Navigation Commissioners; London Gaslight Company Bill, of Metropolitan Board of Works; Southwark and Vauxhall Water Bill, of London and South-Western Railway Company; Wandsworth and Putney Gas Bill, of Metropolitan Board of Works; Wrexham Water Bill, of Great Western Railway Company.

A petition against the Wakefield Corporation Water Bill was presented from Henry Savile; and two petitions against alterations in the Bill were presented from (1) Corporation of Halifax, (2) Owners, &c., of mills, &c.

LOCAL GOVERNMENT (GAS) PROVISIONAL ORDER BILL.—This Bill, to confirm a Provisional Order of the Local Government Board under the provisions of the Gas and Water Works Facilities Act, 1870, and the Public Health Act, 1875, relating to the borough of Conway, brought in by Mr. Hibbert and Mr. Dodson, was read the first time, and referred to the Examiners.

MONDAY, MAY 24.

GAS AND WATER ORDERS CONFIRMATION BILL.—This Bill, for confirming certain Provisional Orders made by the Board of Trade under the Gas and Water Works Facilities Act, 1870, relating to Chew Magna Gas, Garstang Gas, Halstead Gas, Harrogate Gas, Holywell Gas, Long Eaton Gas, Trowbridge Gas, Broadstairs Water, East Blatchington and Seaford Water, Gisborough Water, Harrogate Water, Luton Water, Newhaven and Denton Water, Norwood (Middlesex) Water, and Pwllheli Water, brought in by Mr. Ashley and Mr. Chamberlain, was read the first time, and referred to the Examiners.

TUESDAY, MAY 25.

The petition of the Malton Local Board against the Malton Gas Bill was withdrawn.

THURSDAY, MAY 27.

The petitions of (1) Cheshire Lines Committee, (2) Sheffield and Midland Railway Companies Committee, (3) Mersey and Irwell Navigation and Bridgwater Navigation Companies, against the Liverpool Corporation Water Bill, were withdrawn.

Miscellaneous News.

MANCHESTER DISTRICT INSTITUTION OF GAS ENGINEERS.

The Forty-second Quarterly Meeting of this Association took place last Saturday. The members met at the Ashton-under-Lyne Gas-Works—Mr. W. CARR, the President, in the chair.

The HONORARY SECRETARY (Mr. R. Hunter) read the minutes of the previous quarterly meeting, which were confirmed, and the following gentlemen were elected members of the Institution:—

Mr. Joseph Hall, Manager of the Corporation Gas-Works, St. Helen's.

Mr. Henry Hawkins, Manager of the Local Board Gas-Works, Hindley, near Wigan.

After inspection of the Ashton Gas-Works, the members adjourned to one of the retort houses, where Mr. D. Clarke, the Manager of the works, had provided luncheon, to which about fifty members and friends sat down. The members then went in two four-in-hand coaches to the Mossley works of the Stalybridge Gas Company; after the inspection of which they proceeded to view the water-works in course of construction, at Greenfield, for the Ashton and Stalybridge Corporations and District Joint Committee, where they were courteously received by Mr. Bateman, the Resident Engineer, who personally conducted them over the works, in which great engineering difficulties have been met and conquered. Mr. Bateman afterwards joined the members at a spread provided at the inn known as "Bill-o'-Jack's," and to which ample justice was done.

A hearty vote of thanks to Mr. Bateman was carried with acclamation, for his kindness in conducting the members over the works; and votes of thanks to the President and to the Sub-Committee, for the satisfactory arrangements made for the day, were carried with applause.

The members and other friends then returned to Ashton, and thence by rail to their respective destinations.

METROPOLIS WATER SUPPLY.

CITY COMMISSIONERS OF SEWERS.

A Meeting of the Commissioners of Sewers of the City of London was held last Tuesday—Mr. T. RUDKIN in the chair—when the following report from the Finance and Improvement Committee was presented:—

Agreeably to your references to us of Feb. 3 and March 16 last, we have from time to time had under consideration the question in regard to the projected sale of the Metropolitan Water-Works to a Metropolitan Water Trust. We were about to confer with the Joint Gas and Water and Local Government and Taxation Committee upon the Bill introduced in the last session of Parliament to give effect thereto, when the said Bill was for the time dropped, and shortly afterwards Parliament was dissolved.

Immediately on the formation of the new Government, we sought a conference with the Secretary of State, with a view to ascertain what course Her Majesty's Government proposed to take in reference to the matter, when the Home Secretary expressed a desire to have the views of the City Authorities as to the desirability of purchasing the Water Companies interests, the proposed terms of transfer, and the formation of the Water Trust.

We have since conferred with the Joint Committee of the Corporation with a view to harmonious action, and having further considered the question generally, we, without expressing any judgment on the provisional agreements entered into for the purchase of the Water Companies supplying London with water, are of opinion that as those agreements have been made, after lengthened negotiations, on the assumption that they are beneficial to the consumers, it is expedient that they should be carefully inquired into by a Select Committee of the House of Commons, with a view of ascertaining whether all or any of them are beneficial to the inhabitants of the Metropolis, and should be carried into effect, or whether the expenditure contemplated under the agreements for acquiring the existing supply might not be more advantageously spent in procuring a new and better supply of water for London.

We are also of opinion that the Corporation should be prepared to take part in the inquiry, and co-operate therein.

Mr. MANNERS (Deputy-Chairman of the Committee) having moved the adoption of the report, a discussion on the subject took place, in the course of which

Mr. J. S. SCOTT moved as an amendment, but it was not seconded, that no further steps be taken in the matter; believing, he said, that it was inexpedient, in the interests of the citizens, for the Commissioners to take the initiative in the settlement of the question.

Mr. BEDFORD then moved, and Mr. SCOTT seconded, an amendment to the effect that the inquiry into the Water Supply of the Metropolis should be local rather than parliamentary; whereupon another discussion ensued, the result being that a show of hands was taken, and it was negatived. Meanwhile, however,

Mr. ASHLY had proposed the following addition to the report:—"That amongst the many defects at present existing in regard to the water supply, the Commissioners desire to draw particular attention to the basis of charge for water as requiring reconsideration, and they suggest that the attention of the Select Committee should be called thereto."

Some opposition was shown to this proposal; but, eventually, on another show of hands being taken, the report of the Committee, with the addition proposed by Mr. Ashly was adopted by a large majority.

COURT OF COMMON COUNCIL.

Last Thursday a meeting of the Court of Common Council, under the presidency of the LORD MAYOR, was held, at which the report referred to in the above-mentioned proceedings was brought up for adoption.

Mr. RUDKIN formally moved that the Court agree with the recommendations of the Commissioners of Sewers, upon which

Mr. M'GEORGE moved, and Mr. STAPLETON seconded, as an amendment—"That, however important and desirable it may be to deal with the Water Supply of the Metropolis, yet, in the opinion of this Court, it is inexpedient to proceed further at present with the preliminary agreements entered into by the late Government with the Companies;" but on a show of hands the motion for the adoption of the report was carried by a large majority.

DEPUTATION TO THE HOME SECRETARY.

On Friday last a deputation from the Metropolitan Board of Works had an interview with the Home Secretary (with whom was Mr. Dodson, President of the Local Government Board) on the subject of the Water Supply of the Metropolis.

Sir J. M. HOGG, M.P., the Chairman of the Board, in introducing the deputation, read a document setting forth the views of the Board on the question. It stated that the transfer of the Metropolitan Water Supply from the control of trading companies to a body representing the consumers had for many years been advocated by those who had been specially concerned in promoting the health and well-being of the people; but the question had now taken such a firm hold on the minds of the public at large as to make its settlement a matter of public urgency. There was a strong and general conviction that the time had come when the settlement of the water question should cease in any way to depend on the interests of trading companies, and should be viewed in the interests of the consumers. There was, however, a clear perception of the fact that the change, if further delayed, would increase the cost and the difficulty, and that if the change had been effected a few years ago millions of money might have been saved. The Metropolitan Board found themselves in a difficult position. It would be remembered that expenses incurred by the Board in promoting their Water Bill were last year disallowed by the Government Auditor, and the effect of this disallowance was only removed by an Indemnity Act, which, while authorizing the expenditure already incurred, confirmed the decision that the Board, in incurring it, had exceeded their legal powers. In these circumstances, the Board had come to the conclusion that the proper course was to bring their decision under the notice of Her Majesty's Government. The Board claimed to have the management of the water supply. This claim did not arise solely from the fact of their having the management of the whole Metropolis; it was also justified by the consideration that important functions already entrusted to them by statute could be discharged with greater benefit to the Metropolis if the supply of water were under their control. By the Metropolitan Fire Brigade Act of 1875 the Board were made the authority for extinguishing fire and the saving of life and property in case of fire in the Metropolis. It was unnecessary to show how much the efficiency of the fire-extinguishing service depended upon the pressure of the water supply, and how desirable it was for the authority that had control of the one to have control also over the other. The Board were of opinion that the ratepayers of the Metropolis would not be satisfied unless the water supply were placed under the authority of a representative body over which they would have complete control. With respect to the objection that the area of the supply of water extended beyond the Metropolis, and that it would be unjust to the inhabitants of the districts outside to place them under an authority representing the Metropolis alone, it would surely be possible to find some means of reconciling the rights and interests of those districts with the necessity of placing the water supply under the control of a representative body. But even if this could not be done, the inhabitants of the water districts would be placed in a better position by the change. They were now supplied by Companies who wished to make a profit for their Shareholders. The first object of the Board would be to give the public the best supply of water, and the condition under which an outer district would be supplied would be more favourable than that which now existed. The Board were ready to consider whatever course might be deemed necessary by the Government. Should the Government be of opinion that it would be well for the Board to devise a scheme, and lay it before Parliament, the Board were ready to do so if the Government would obtain for them the necessary enlargement of their powers. If, on the other hand, the Government would prefer to introduce a Bill, the Board would be ready to give careful consideration to any plan which might be proposed. In conclusion, the Board suggested that there should be an inquiry by a Select Committee into the terms of the provisional agreements made between the late Home Secretary and the Metropolitan Water Companies, and into the legal rights of the Companies and their relations with the consumers. This inquiry the Board would be happy to assist in every way, both by appearing before the Committee upon their right to do so being made clear on an order of the House of Commons, and by laying before the Committee all the information in their possession on the subject.

Mr. RICHARDSON, the Chairman of the Parliamentary Committee of the Board, having, at some length, supported the proposals contained in the foregoing statement,

The HOME SECRETARY, in reply, said: I need hardly state that I regard it—and Mr. Dodson, I am sure, will concur in the sentiment—as a very great advantage to the Government to have the presence and the advice and assistance of a body representing so large a proportion of the ratepayers of the Metropolis as the Metropolitan Board do. In any remarks I may make you will quite understand that it is necessary for me to be extremely cautious, because anything I may say might possibly affect pecuniary interests of great value. Nobody can doubt the great complication in which the whole of this question at present stands. It is left in

a state of chaos from which nothing can extricate us except a good deal of "bear and forbear" upon all sides of the question, with a view to bring the matter to a satisfactory solution. Certainly, as far as the Government are concerned, their object is to act upon this principle in securing the co-operation of all parties with a view to an early settlement of the question. An observation dropped from the gentleman who has just sat down was not strictly accurate, when he spoke of a Bill now before the House of Commons. There is no Bill in the House of Commons. The Bill of the late Parliament and the late Government is dead; and certainly, as at present advised, and with my present state of information, I know of no intention to revive it. But, apart from that Bill—I do not say independently of it—there are certain agreements which have been made. Now, opinion appears to be very much divided on the subject of these agreements. There are naturally some persons—the persons who negotiated the agreements, and those who are their friends and supporters—who think they are very good agreements, and favourable to the public. There are other persons, whose opinions are entitled to quite as much weight, who think they are not good agreements, and that they are very unfavourable to the public. In these circumstances, of course, the Government might undertake for themselves an official, departmental, and private inquiry; but I do not think this would be a desirable course. It is necessary that the public and the ratepayers who are interested in the matter should be thoroughly satisfied, by a public inquiry, as to the value or the non-value of these agreements; and I believe nothing short of this would meet the present exigencies of the case. One of the great embarrassments and difficulties in the way is the intricate character of the question, and so the public are perfectly unable to form a judgment of the value of these agreements. Well, then, this certainly must be the first preliminary step. If upon an examination of the agreements they should turn out to be as extravagant as some people suppose, of course there would be at once an end of the whole of the present—I should, perhaps, call it the late—scheme of purchase, and there would be one point finally settled. If upon examination they should turn out to be more favourable and better terms than many persons suppose, it would then have to be considered what should be done with them. It is said that there has been considerable delay. This is perfectly true; but it is nobody's fault. Great political exigencies cannot yield even to Water Bills. If we come to the conclusion that neither these terms nor any that the Companies will consent to accept are reasonable, then we must look to some other course. I do not think it is possible that things can revert to their former state, or remain as they are at present. The public will not, and ought not to consent to give an unreasonable price, even for one of the first necessities of life; neither will they put up with a supply inadequate in quantity and defective in quality. If the Water Companies will not deal with the ratepayers on reasonable terms, the ratepayers and Parliament are not impotent to find some other resources. The terms amount, as it is estimated, to 30 millions; but upon information which reaches me, and which I believe to be well founded, they would turn out to be considerably more; and it is for the public and those who represent them to consider whether this is a price which it is worth while to give for the article, or whether at that cost, or even at a less cost, they could not supply themselves with a better article. The Water Companies have no monopoly in the supply of London. That is a clear proposition. No doubt there may be difficulties and inconveniences in introducing a new supply, but these may be overcome. It is not beyond the resources of legislation or of science. I have heard something said on the danger of delay. It is urged that we must take the terms, whatever they are, without stopping to consider them, lest the water-rents should be raised; and there has been an alarm on the subject of assessment. I wish to remove an error upon this subject. The water-rents do not rise according to the assessment; the assessment is only an element of evidence. The legal right that the Water Companies possess is to take the rents upon actual value, whether the assessment corresponds to it or not. But I am not myself disposed to be very much alarmed upon this subject. The Companies have not generally raised their rents according to their powers, and I do not think it is very likely, when we are asked to be in a great hurry upon the subject, that the Companies would challenge public opinion upon it. If they did so, of course that would make the course of the ratepayers and Parliament quite clear. I am only referring to these matters as possible alternatives. It would be a very proper subject of inquiry, as your memorial suggests, first of all to see what these agreements are worth, and whether reasonable terms of purchase are offered. If the terms are reasonable, then we have to consider whether the thing is worth buying upon reasonable terms. But if the thing be not available upon reasonable terms, or if, even upon reasonable terms, it be not worth the acquisition in perpetuity by the public, well, then, as I said before, some other course must be sought, and, if so, I need not say that the ratepayers and the Government would look to the Metropolitan Board of Works as one of the most powerful engines for assisting them in the difficulty. The Government have received from the bodies representing the City of London—from the Commissioners of Sewers and the Court of Common Council—an application very similar to that of the Metropolitan Board of Works. These bodies also desire that the agreements should be examined. They ask that a Select Committee of the House of Commons should be appointed to examine the agreements, and also to ascertain "whether all or any of them are beneficial to the inhabitants of the Metropolis, and should be carried into effect, or whether the expenditure contemplated under the agreements for acquiring the existing supply might not be more advantageously spent in procuring a new and better supply of water for London." They also state that they are "prepared to take part in the inquiry, and co-operate therein." They end by saying that, amongst the many defects at present existing in regard to the water supply, they "desire to draw particular attention to the basis of charge for water as requiring reconsideration, and they suggest that the attention of the Select Committee should be called thereto." This I understand to refer to the system of charge by which the Water Companies are authorized to raise their water-rents without increasing the accommodation, so that without any new or better service their receipts are augmented by the growth of the wealth of the Metropolis. This, I think, as the Corporation suggest, is a very fair subject of inquiry. The Government have not adopted these agreements. They do not promote or support them. They find them existing, and they are very willing that they should be inquired into. I think I may say the opportunity which the Board of Works desire will be furnished. The agreements will be placed upon the table before the Committee, and those who are responsible for them will, of course, explain them, and the Metropolitan Board and the Corporation of London, who also desire to take part in the investigation, will have an opportunity of thoroughly examining them and discovering what they are worth. You cannot call the Water Companies, in other circumstances, to your bar and examine them, but you have the agreements made with the Companies. You are entitled to examine these, and to see what relation they bear to the actual condition of those Companies. This in itself will be a great public advantage. As to whether the scope of the Committee should be extended, that is a matter upon which I must ask you to allow me to reserve my judgment for the present. It is a matter which it would be my duty, and also Mr. Dodson's, to bring under the consideration of the Cabinet. It is evidently not desirable that the Committee should be embarked in an inquiry of an extremely protracted character. But the first step, I think, is perfectly clear. The Government are extremely desirous of, and extremely grateful for the co-operation of the Metropolitan Board of Works. Any assistance which the Government are enabled to offer to the Board to enable them to take their legitimate and natural part shall be freely given.

Sir J. M. Hogg thanked the right honourable gentleman, and then the deputation withdrew.

IMPERIAL CONTINENTAL GAS ASSOCIATION.

The Half-Yearly Ordinary Meeting of this Association was held at the City Terminus Hotel, Cannon Street, London, on Monday, the 24th ult.—Sir Julian Goldsmid, Bart., in the chair.

The Secretary (Mr. R. S. Gardiner) read the notice convening the meeting, and the following report of the Directors:—

The present half-yearly ordinary meeting of the Proprietors has been convened, agreeably to the Company's Act of Parliament, for the purpose of receiving a report from the President and Directors upon the affairs of the Association, and for declaring a dividend for the half year ended Dec. 31, 1879.

Gas Made.—The quantity of gas made at the fourteen old stations in the half year ended the 31st of December last was 2822 million cubic feet. The quantity made in the corresponding half year of 1878 was 2766 million cubic feet, showing an increase of 56 million cubic feet, or at the rate of 2·02 per cent. The quantity of gas made at the sixteen new French stations in the half year ended the 31st of December last was 74 million cubic feet, giving a total increase of 130 million cubic feet, or at the rate of 4·70 per cent., and showing a total make of 2896 million cubic feet.

Lights.—The number of lights at the fourteen old stations, on the 31st of December last, was 1,232,346. The number on Dec. 31, 1878, was 1,195,908. These figures give an increase of 36,438 lights, or at the rate of 3·05 per cent. The number of lights at the sixteen new French stations on the 31st of December last was 41,623, giving a total increase of 78,061, or at the rate of 6·53 per cent., and showing a total number of lights of 1,273,969.

Mains.—The length of mains laid at the fourteen old stations on the 31st of December last was 1181 miles. The length of mains on Dec. 31, 1878, was 1162 miles, being an increase of 19 miles. The length of mains laid at the sixteen new French stations on the 31st of December last was 85 miles, giving a total increase of 104 miles, and a total length of mains of 1266 miles.

Rental.—The rental for the half year ended the 31st of December last was somewhat augmented, and the profit about the same, when compared with the corresponding half year of 1878.

Coal.—The cost of coal employed at the fourteen old stations during the half year now under review was 1s. 3·9d. per ton less than that of the coal used in the corresponding half year of 1878.

Secondary Products.—There was an increase in the value of coke of nearly 9 per cent., and a slight increase in the value of tar. The returns for ammoniacal products were fairly satisfactory.

General.—The outlay during the half year for alterations and extensions was less in amount than in recent half years.

New condensers were erected at Berlin, Lille, and Erdberg (Vienna), and the purifiers at Haarlem and Frankfort were improved at some expense.

Considerable progress was made with the new buildings at Baumgarten (Vienna), and with the retort factory at Erdberg. At the close of the half year the Baumgarten works were nearly completed.

The necessary expenditure was incurred for the extension and enlargement of mains at all the stations.

The Directors regret having to announce the death, on the 19th of July last, of Mr. George William Drory, who for upwards of 54 years rendered such valuable service to the Association, and who, upon his resignation of the office of General Superintendent in 1878, was appointed Consulting Manager. It is also with regret that the Directors record the death of their late Secretary, Mr. Albert Francis Jackson, which occurred but a few months after his retirement. They have appointed as his successor Mr. Robert Septimus Gardiner.

The contract with the Municipality of Ghent for the public lighting will expire on July 1, 1881. Negotiations have, at intervals, been going on for many years past between the Authorities and the Association, for the purpose of renewing this contract, and the Board has done all in its power to come to terms; but finally, in October last, the Municipality decided to obtain tenders by public advertisement. The Board, which had determined to make all possible concessions, sent in a very low tender; but, unfortunately, one of the numerous financial companies which act as promoters of other companies offered a lower price, which was accepted. The result is that a lawsuit is likely to arise between the Municipality and the Association, whose contention is that, under its original powers, it has the right to continue to supply gas to private consumers, although it is no longer the contractor for the public lighting.

The President and Directors desire, in conclusion, to draw the attention of the Proprietors to the accounts for the half year ended the 31st of December last. These have been duly audited, and from them the Directors have, in accordance with the provisions of the Companies Clauses Consolidation Act, prepared a scheme showing the profit of the Association for the half year, and the portion thereof applicable to the purposes of dividend, which the President and Directors recommend now to be declared—namely, a dividend of 5 per cent. for the half year ended the 31st of December last, and a bonus of 1 per cent., payable, free of income-tax, on and after the 15th day of June next.

The Directors who go out of office by rotation are Sir Julian Goldsmid, Bart., Nathaniel Montefiore, Esq., and Francis Bassett, Esq. These gentlemen are all eligible for re-election, and offer themselves accordingly.

The Auditor who goes out of office is Thomas Newton Stokes, Esq., who is also eligible, and offers himself for re-election.

The Chairman: Gentlemen, there are several observations which I shall have to make on behalf of the Board with reference to the report you have just heard read. Before, however, I do so, I desire to say, on behalf of Sir Moses Montefiore, who has been very unwell, that he exceedingly regrets, as we all regret, that he is unable to attend this meeting, and he joins with us in deploring the loss which the Board have sustained since the date at which the report closes—the loss of my predecessor in this chair, Mr. Twells, who died a very short time ago, and who, as you are aware, rendered long and valuable services to the Association. I am quite sure that all the Proprietors will remember the constant courtesy and kindness which they received upon every occasion from Mr. Twells; and, therefore, they will share with us the feelings I have ventured to express. Now, gentlemen, with regard to the report, the most serious point in it is the one to which I desire to refer at the outset, and that is the question with regard to Ghent. Those of the Proprietors who have attended on the occasions when I have occupied the chair will remember that I have frequently said that our great difficulty is that we are not freeholders at the different stations we occupy, or which we light, and that from time to time we have to enter into fresh contracts with the Municipalities, who sometimes make enormous demands, and whose expectations cannot always be realized. I must say that this has been the case with regard to the town of Ghent. Some years ago we prepared a contract which I believe was an exceedingly favourable one to the town, and we thought that practically the business was concluded, when suddenly, almost without notice, it was broken off by the town. From time to time, too, when attempts have been made to renew negotiations, I cannot say they have always been received as we could have wished; and last year, when we were asked to make fresh proposals, which we did most willingly, other persons were also invited at the same time, of which we knew nothing till afterwards, when we heard that some tenders had been sent in. But apart from this difficulty, I believe we should have been able to settle the contract with the town if it had not been for the recent practice of certain French financial companies of cruising about all over the world in the endeavour to find something out of which to make a considerable profit, perfectly regardless of what happens afterwards to the new company they may have formed. You all know that some years ago I had to make similar remarks with regard to Bordeaux. The town of Bordeaux had made a contract with the Gautier Company, which was

subsequently disapproved of by the Council of State; and orders were sent from Paris to the Municipality of Bordeaux to put up the lighting of the town to public tender. The Municipality adopted a *cahier des charges* which was totally unreasonable for any gas company, but was acceptable to a financial company, and that company was the Société Financière. They did not take it for themselves, but for a company that was to be established, and that has been established for some years, called the Gas Company of Bordeaux. Of that Company I do not wish to say much. Up to the present time it has paid dividends—I do not know that they have been of any large amount—but I believe it has always had many difficulties to contend with, as it would have, with the *cahiers des charges*, and it is at present occupied with the conduct of 40 lawsuits. That is the sort of thing which occurs. As to what the future of that Company will be, I could make a prophecy, but I decline to do so. I may say, however, I am glad I am not a shareholder in it, and if I were I should follow the shrewd advice of those who say "Sell at a profit if you can," and not keep my shares long. It is, as I have said, the practice for certain financial companies on the Continent to look about for something out of which they can make a profit, and this has occurred at Ghent. The financial company went in at a price which cannot be considered to be remunerative, having regard to the working of a gas company, and it has not taken it for itself, but for a company which is going to be, or is established, and the company is to be called, in the same manner as in the other case I have mentioned, the Gas Company of Ghent. I could also prophesy what the future of that Company will be, but I decline to do so. All I say is that we have a very awkward and disagreeable state of affairs indeed to face when we have a contract coming to an end. On this occasion I believe the Board of Directors have done all they could to meet the wishes of the Municipality. Mr. Wood and Colonel Wilkinson have been over to Ghent, and the late Mr. Wingfield, our Inspector of Accounts on the Continent, also went; but the business has not turned out at all satisfactorily, and we shall have to carry on a lawsuit with the town. The matter in dispute is this: We say that under the original powers granted to us we have the right to continue to supply private lighting, although no longer the contractors for public lighting. The town say we have not a leg to stand upon, and that is the question to be decided. In considering this matter we have to provide for all possible eventualities, both for success and failure, and before we declared the profit this year we put aside a certain amount to go towards meeting the possible eventuality of some considerable loss at Ghent. I do not say that we shall or shall not incur loss—this will be revealed afterwards; but before you strike your profit you must consider all the circumstances of the business, and I think you will see that in this respect we have exercised a wise discretion. If there is any one who likes less than another a lawsuit, it is one who has been brought up a lawyer; and I was brought up a barrister. I have the greatest distaste for anything like a long lawsuit, and I believe the Board have the same feeling; but we must vindicate our rights, and try as far as we possibly can to protect your property and interests. This is the great difficulty that a gas company on the Continent has to deal with. We have not, and cannot have, the position which in England is acquired under an Act of Parliament, and although we may do all we can to meet the authorities, we know that on more than one occasion a gas committee has been appointed and has thought certain proposals made were eminently satisfactory, but which, when submitted to the general council, have been rejected by them by every vote excepting those of the gas committee, and rejected by them not because they knew more of the subject, or that the proposals were unreasonable, but because the popular voice was against accepting them—the popular voice, which I think is frequently the voice of ignorance, and which, on a scientific and technical question, could not consequently fairly express any opinion. It is not like a question with regard to general politics, on which we are all supposed to know something; but as to the arrangements of a gas business, I believe there are very few in a Town Council who can say that they know much. With regard to the general business of the Association, all I have to state is that, during the past six months, it has been very satisfactory. We have concluded very good contracts for our secondary products and our coal, and if this were not so, as we have had to make the provision we have made with respect to Ghent, we should not be able to declare the present dividend, but after allowing for this business, we find we can pay the same dividend as before. I therefore think our position in this respect is strong and satisfactory. We have done another thing which I believe it was mentioned on a previous occasion was intended to be done by the Board. We have written the amount for which our works at Toulouse stood in our books, down to the amount that is fairly represented by the property there—the land. We intend to keep the capital account fairly in proportion to what we consider to be the value of our property. I believe this is a view which every sound man of business would say is right, and as we have difficulties to contend with, I think if we ever err at all, erring on the side of caution is the right thing. To turn to another matter. We have constantly brought before us fresh concessions—sometimes for places utterly unknown to the outside world, where there is some individual who wishes to make profit out of us, the profit to the Association being very doubtful. The number of such concessions brought before us surpasses my memory; but every now and then we think there is an opportunity for getting something useful, and, if you remember, it was upon this principle that we two years ago added to our business what we call the new French stations. They are improving very considerably, and no doubt the view we entertained when we bought them is a sound one—that they will form a valuable part of the business of the Association. There are one or two other places—I will not say where they are, they are not very big—with regard to which we are at present carrying on negotiations. We hope that in course of time we shall be able to bring them to a satisfactory result; but I think if I told you where they are it would be the best way of settling the point that we should not have them. This is a position which probably all those who have been frequent attendants at these meetings will thoroughly understand—that where competition is so keen, not between gas companies alone (we are not afraid of that), but between gas and financial companies and other speculators, you must be very much alive to your own interests, and give as little information as possible. Therefore, with the permission of the meeting, I will not say any more on this subject. As far as regards the concern generally, I do not know that there is anything further of importance to tell you. You all know of the death of Mr. Drory, and also of the death of Mr. Jackson, who was for 13 years the Secretary of the Association. We have replaced him by a gentleman who we thoroughly believe will make a most active and efficient Secretary. He has very considerable duties to perform—duties of great importance in carrying on our business. I have also to announce that since the date of our report Mr. Wingfield, who was our Inspector of Accounts on the Continent, died very suddenly in the month of January last. He had only been a short time—about two years and a half—in the service of the Association. It was an office which we established after the most mature consideration, because we thought it was very desirable that all the accounts upon the Continent should be carefully investigated by an independent authority from London; and not only this, we desired—a desire which Mr. Wingfield carried into effect—to establish an absolutely uniform system of keeping the accounts at all the stations. It has very much facilitated the conduct of our business, and has much assisted the different officers in making their reports for the Board in London. There were many other matters which fell on Mr. Wingfield's shoulders from time to time—matters he had to investigate, and negotiations he had to carry on, all of which he conducted with great activity and zeal, and with the desire to serve the interests of the Association. It was with great regret, therefore, that we had to face the position in which we were placed by his unexpected death. We had numerous applications for the office, and we hope we have selected in Mr. Lindon, who has been appointed to succeed Mr. Wingfield, a gentleman who will act with the spirit which his predecessor always displayed. Mr. Lindon has already been three times to the Continent, and is at present in Vienna looking after the affairs of the Association, and I trust the loss we have sustained by Mr. Wingfield's death will be repaired by the appointment we have made. I do not know that there is anything more for me to say. The Board have had, and have now, a number of most anxious questions to consider. Our work is not very easy, for we have such widely different interests to meet and views to contend with; but we shall always do what we can not only for the interests of the Shareholders, but for the interests of the public we serve, because we do not believe for a moment that those interests are antagonistic. We think that if we can make fair reductions in price, and try to meet the local authorities in the spirit we desire to see them display towards us, this is the way in which we should carry on the business of the Association. The confidence of the Shareholders in the Board has added very strongly to our position. I see no reason to doubt that this will be the case in the future, and therefore I trust this confidence, which I thankfully acknowledge, will continue to be displayed towards all my colleagues and myself. I know that as vacancies occur—and one has just occurred through the death of Mr. Twells—we have many applications from gentlemen wishing to join the Board; but as the business of the Board requires not only a very considerable amount of knowledge, but a large devotion of time, and on the part of many of its members frequent journeys to the Continent, it is not always easy to fill up a vacancy. It is, therefore, only after most careful consideration that we recommend any gentleman for a seat at the Board under the powers we have. The present vacancy will be filled up in this manner, after mature consideration, and after taking the advice of Sir Moses Montefiore. If there are any other matters on which, consistently with the interests of the Association, I can give you information, I shall be ready to do so; but, as I have on more than one occasion ventured to point out to you, not only is the *salus* of the Shareholders our *suprema lex*, but very often the supreme law urges us not to tell them everything. I constantly trust to that discretion which I believe they have always exercised towards us, and I am sure they will not ask questions which it will be inconvenient for us to answer. I now move—"That the report upon the affairs of the Association now read be received, adopted, and entered on the minutes."

Mr. VYVYAN (a Shareholder) seconded the motion.

Mr. KEENLYSIDE asked when the Ghent concession expired.

The CHAIRMAN: In July, 1881.

Mr. KEENLYSIDE observed that the Directors had taken a very large sum of money to provide for anything in connection with the expiration of the concession. Did they intend to take three sums of money to make up what might be wanted, or had they fully provided?

Mr. DUFF FILER said he had been connected for 53 years with gas companies. He endorsed every word that had fallen from the Chairman as to the propriety of as much as possible keeping their affairs from becoming known on the Continent.

Mr. ROKEBY PRICE said he requested on a former occasion that the names of the Directors might be notified to the Shareholders, and he regretted that this had not been done in the notice convening the meeting. He thought they ought to know who the Directors of the Association were when they were called together. All gas and railway companies gave this information, and he thought it should be given to the Shareholders in this undertaking. It was one of the old relics of the past not to do so. The report had been read very well by the Secretary, but it was quite impossible for all present to carry the figures in their heads, and make any remarks on them. He had in his hand the figures of the accounts, which every Shareholder had the opportunity of taking when he went to the offices of the Association; but the statement was not one which could be criticized with any degree of accuracy or certainty. It was put in a particular form, no doubt because their enemies should not know more than they ought to; but he could not help seeing that the contingency-fund and the investment-fund were very large. With regard to the amount which the Directors had put by against Ghent, it did strike him that to put by enough out of 1879 for what might occur in 1881 was rather bordering on what was unnecessary. He should like to know whether they had put by enough for all that might occur in 1881.

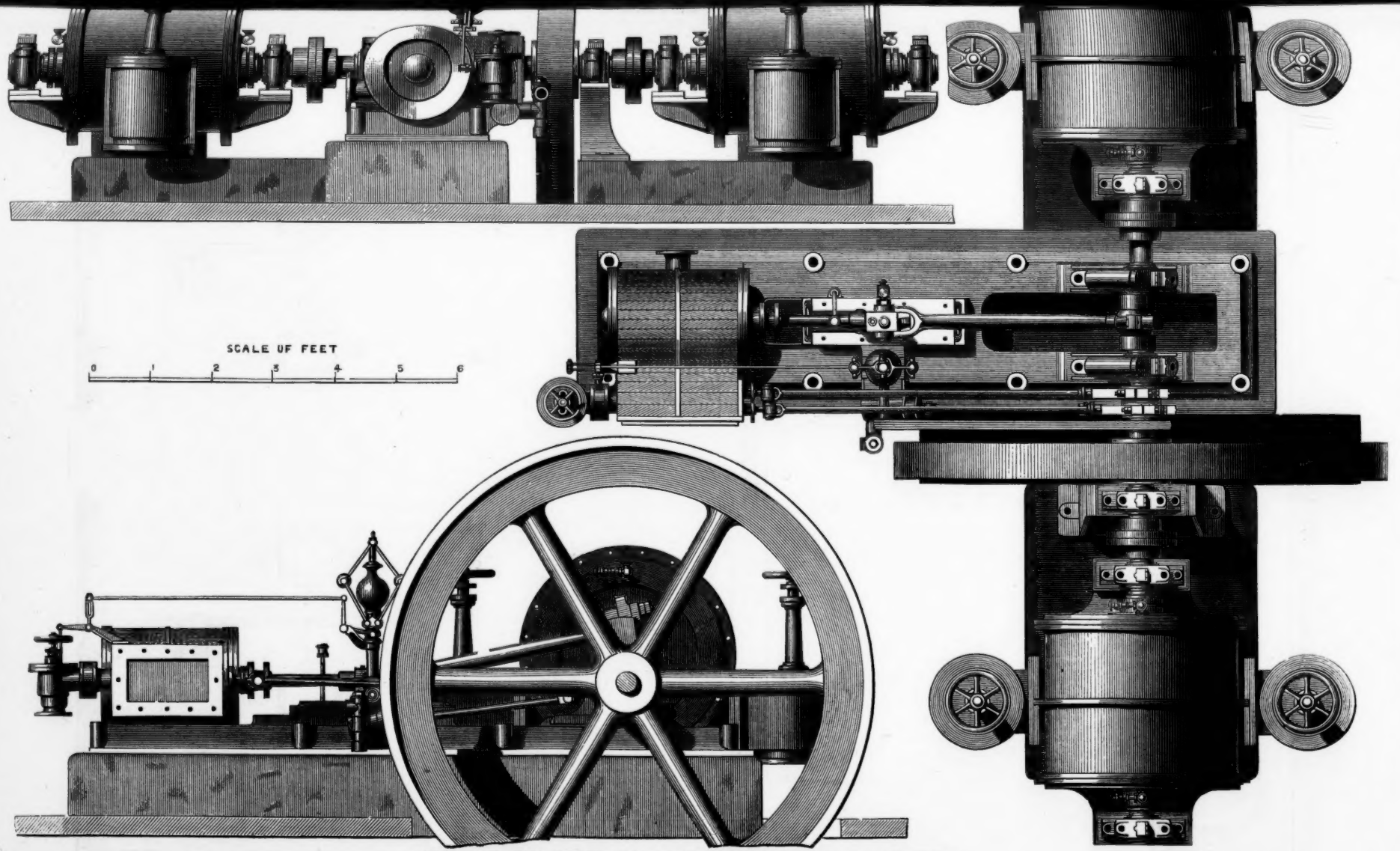
The CHAIRMAN: Oh, no.

Mr. PRICE said he was glad to hear this. There were no figures given in the report as to the amount of expenditure at the various stations; but he did not know why these should be kept back. It was very important to the Shareholders to know how much had been spent out of the revenue for capital purposes at all the stations. He did not wish to press the Directors too far, but he should like to have this information. There was one other question he desired to ask. When the Cologne contract expired, he understood from the Chairman that if the Municipality refused to renew it, there was to be a valuation of the works, and that they were to take them at such valuation. He should like to know whether this was the case with regard to Ghent. Then as to the reserve and contingency fund, he should like to know how much more that was, comparing the past half year with the corresponding period of 1878—what the difference was, say, in the items of sundry debtors, cash at the bank, and other investments, and the contingency and reserve fund—how much more there was there than in the corresponding half of 1878, because he really thought the Shareholders ought to have a larger dividend than they were to receive. He did not think the Directors ought to make too large a provision for 1881. They had three half years before the Ghent contract expired, and should this period not be very nearly long enough to provide all that was required? If they thought that the year 1879 should put something towards the necessary amount, he still urged that they should not take too much. With regard to the deaths of the different gentlemen mentioned, no one could regret it more than he. He believed that for Mr. Drory the Shareholders all had very great respect. With regard to Mr. Jackson, he was equally good in his place. As to his friend Mr. Twells, he was very sorry that he was gone. He was a most valuable, sound, painstaking, and honourable man, and he knew no person in the City of London in whom he had more confidence.

The CHAIRMAN: I have had the pleasure of hearing very much the same speech from Mr. Rokeby Price on two or three former occasions, excepting with regard to the mention of the gentlemen whose services we have lost, and I shall be very glad to give him very much the same answer as before—that is, that the Board very wisely, even before my time, and also during the 12 years, I think it is, that I have been a Director of the Association, have from time to time increased the dividend when they thought they could fairly do so, and could maintain that increase. The

PLAN SHOWING THE ARRANGEMENT OF THE FOUR PAIRS OF EXHAUSTERS AND ENGINES, ALSO OF THE BOILER-HOUSE TWO BOILERS BEING FIXED, WITH SPACE FOR A THIRD.

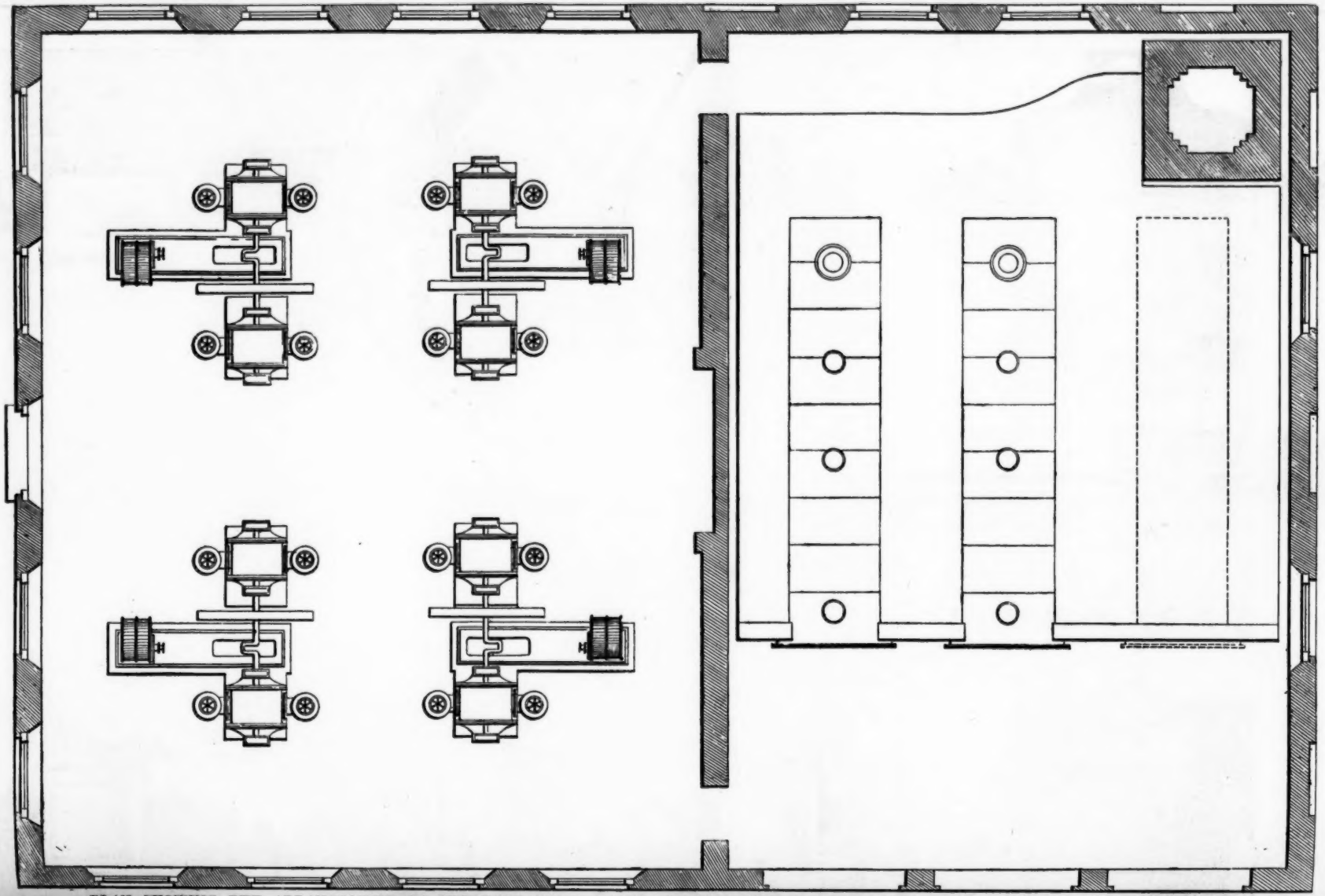
SCALE ½ INCH = 1 FOOT.



SIDE AND END VIEWS AND PLAN OF ENGINE AND EXHAUSTERS.

APPARATUS FOR PUMPING GAS FROM LINACRE TO LIVERPOOL.

DESIGNED BY Mr. WILLIAM KING, C.E.; AND MANUFACTURED BY Messrs. GWYNNE & CO., OF ESSEX STREET WORKS, LONDON.



PLAN SHOWING THE ARRANGEMENT OF THE FOUR PAIRS OF EXHAUSTERS AND ENGINES; ALSO OF THE BOILER-HOUSE—TWO BOILERS BEING FIXED, WITH SPACE FOR A THIRD.

SCALE ⅛ INCH = 1 FOOT.

Board have always been of opinion that it does not do to be always rushing up and down in dividends, but that as far as possible it is much the better plan to establish a steady position for the property of the Association—to try and not give anything they do not hope they will be able fairly and reasonably to maintain. I remember being once in the chair when I had to announce a very considerable reduction in the dividend, in consequence of the enormous rise in the price of coal. It was a reduction we could not help facing, but I believe it would have been much more serious, and much more felt by the Proprietors, if we had adopted the suggestion which has been advocated. We have never supported a jumping up and down of the dividend, but have always endeavoured to strike a fair average as far as possible. On this occasion I have no hesitation in saying that it would be unwise to go beyond the provision we have made. I believe every member of the Board was of the same opinion as to the position we took up, and consequently, if you have confidence in the good sense and judgment of the Directors, you will support them in their action in this matter. Mr. Price has asked whether there is not a clause in all our contracts that each Municipality should buy our works if we do not continue to light a particular town. If Mr. Price can get every Municipality to adopt that clause, I shall be most happy to charge him, on behalf of the Company, to go and negotiate it. If you can imagine a common form would be adopted by these municipalities, it would release us from a vast amount of labour and anxiety; but we have to meet in every contract the varied requirements of many people, and sometimes of many unreasonable people; and the consequence is that although we have a clause to this effect in the contracts with some of our towns, we have not it in others. Ghent is one of the latter. If we gain our lawsuit, we shall be able to continue to supply the private consumers; but if we lose it, we shall merely have the value of the works, whatever it may be; and perhaps it is right to inform you that the new Company have already begun to build new works. I am asked if we have made sufficient provision in the half year for all possible eventualities. I said particularly in my former remarks that we had made part provision, but that I did not wish to say what part, because I think that this is not necessary to be stated. We have made some provision, just as every cautious man of business does in the case of possible bad debts, or some other difficulty. Then, with regard to the question as to the amount carried to the undivided profits, an item which has often been discussed at these meetings is the general one appropriated to meet contingencies for enlarging, improving, and repairing the works; and there is a vast number of things covered in this item. Under the Act of Parliament it is our duty to carry such an amount as we find necessary to this fund, to be used in various ways, before we fix the sum available for dividend; and the Board are unanimously of opinion they have recommended as large an amount of dividend and bonus as they can properly do. There is one suggestion Mr. Price made, and I am sorry that it has not been carried out on the present occasion. I shall be very happy to ask the Directors in future to print their names on the notice convening the meeting, if they think it desirable. I am not ashamed of saying that I belong to this Association, in which I am so largely interested, and I do not believe one of the other Directors would be ashamed. If so, the sooner he retires the better. If there is a general feeling that Mr. Price's suggestion should be adopted, I shall be very happy to recommend it. I have also been asked with regard to Cologne. It is rather going back to what is a little like ancient history. The Municipality there, when we proposed to make a fresh contract with them, told us in a very friendly manner that they would prefer to purchase the works and carry on the business themselves. We made an agreement with them, and Mr. Wood took a very active part in it. A valuation of the property was made, and it was sold at this valuation. I think the Municipality of Cologne behaved very well towards us. We have had no such notice from Ghent. We should have been glad if we had, for it might have put an end to litigation. I can assure you that we have done our very best in this matter of the contract. I remember when Mr. Newton, Mr. Wood, Colonel Wilkinson, and I were at Vienna, negotiating the contract; no one could imagine the enormous difficulties we had to contend with; and if Mr. Price knew of them, I think he would see that if we are unable to make the contracts uniform it is not our fault. I think I have answered the various questions put to me, and I now submit the resolution.

The motion was carried unanimously.

The CHAIRMAN: I have now to propose—"That a dividend of 5 per cent. be declared upon the £2,800,000 capital stock of the Association for the half year ended the 31st of December last, and a bonus of 1 per cent., and that the said dividend and bonus be payable, free of income-tax, on and after the 15th of June next."

Mr. J. RICHARDSON seconded the motion, and it was carried unanimously.

The retiring Directors—Sir Julian Goldsmid, Mr. N. Montefiore, and Mr. F. Bassett—were severally re-elected; and Mr. T. N. Stokes was re-appointed an Auditor.

On the motion of Mr. R. PRICE, a vote of thanks was unanimously accorded to the Chairman, for his conduct in the chair, and to the Directors for their services during the past half year.

The CHAIRMAN briefly returned thanks, and in doing so stated that the Association were greatly indebted to their staff for the success attending their operations. The Directors had selected as Mr. Drory's successor Mr. Leonard Drory. They had an excellent staff of officers and servants, and he proposed that a hearty vote of thanks should be given to them.

Mr. WOOD seconded the motion, and it was carried unanimously.

The proceedings then terminated.

ALLIANCE AND DUBLIN CONSUMERS GAS COMPANY.

A Special General Meeting of this Company was held at their Offices, Grafton Street, Dublin, on Monday, the 24th ult.—EDWARD FOTTRELL, Esq., J.P., in the chair—for the purpose of considering a resolution empowering the Directors to issue additional capital to the amount of £50,000, under the power, of the Alliance and Dublin Gas Act, 1874.

The SECRETARY and MANAGER (Mr. W. F. Cotton) having read the notice convening the meeting,

The CHAIRMAN said he had only one resolution to propose to the meeting, and before putting it he would briefly explain the object of the Shareholders being called together. By the Act of Parliament obtained by the Company in 1874, they acquired the privilege of increasing their capital by the sum of £50,000, and such new capital was to be issued by the Directors in such manner as they might deem best for the Company, whether as ordinary or as preference stock. If the stock was issued as preference, it would be at such rate as the Directors thought might justly be put on it; but if the stock was issued as ordinary, Parliament limited the dividend which would be payable on such new stock to a maximum rate of 7 per cent. This was the way in which legislation affecting gas companies had been going of late years. When new capital was authorized to be issued, Parliament required that the new shares should be put up to public auction, according to the auction clause in the Act of the gas company, and limited to 7 per cent., or such other sum as they thought fit, the maximum dividend on this stock. The Directors had arranged that this £50,000 should be issued as ordinary stock, and consequently the maximum dividend payable on it would be at the rate of 7 per cent. per annum. If the ordinary stock at present existing paid 7 per cent. per annum, the new stock would be limited to 7 per cent. If, however, by force of circumstances, the ordinary stock now existing ever came to pay less than 7 per cent.—say 6 per cent.—then the new stock would pay only 6 per cent. He thought it right to explain to the Shareholders exactly what was the nature of the stock which they were to receive. Lest, however, in making this explanation, it should be supposed that he had any doubt whatever that their present ordinary stock would not pay the dividend of 10 per cent., he distinctly stated that he had no misgiving on the subject. However, it was right the matter should be fully explained, as some persons not present, or residing at a distance, might on reading the report be misled into supposing that in taking the stock they were taking on the same terms as the existing stock of the Company. He begged to move—"That the capital of the Company be increased by the issue of 5000 new shares of £10 each. That every holder of 12 shares on May 31, 1880, shall be entitled to one new share, and an additional new share for each 12 shares held by him on the day aforesaid, but a less number of shares than 12 shall not confer any right to a new share. That so many new shares as shall be requisite shall forthwith be offered to the members entitled to the same, and the residue of the said new shares, and also such new shares as shall not be accepted by the members to whom the same shall be offered or their nominees, shall be disposed of by the Directors in such manner as they shall think most beneficial to the Company. That the sum of £2 per share shall be payable at the time of acceptance on all shares offered to members, and in case such payment shall not be made within one calendar month after the date of the reception of such notice the same shall be deemed to be declined."

Mr. WIGHAM (a Director) seconded the motion.

In reply to Mr. J. M. Burke, the CHAIRMAN said the limit of time for paying calls on the new stock was three months.

Mr. BURKE asked whether if the £10 were paid up at once the 7 per cent. interest would immediately accrue.

The CHAIRMAN: No; nor will the £2 now paid up bear fruit till July.

Mr. DOCKRELL asked what would be done with the shares not taken up.

The CHAIRMAN said they would be disposed of for the benefit of the Company.

The resolution was agreed to, and the proceedings terminated.

BAHIA GAS COMPANY, LIMITED.

The Ordinary Half-Yearly General Meeting of this Company was held at the London Offices, Idol Lane, E.C., on Thursday, the 20th ult.—EDWARD HORNER, Esq., in the chair.

The SECRETARY (Mr. A. J. Head) read the notice convening the meeting, and the following report of the Directors was taken as read:—

The Directors herewith present the statement of accounts for the half year ending Dec. 31, 1879.

The half year's working has resulted (after writing off the balance of suspense account) in a profit of £3675 6s. 1d., which, added to the balance brought forward, makes the sum of £5164 8s. 11d., out of which the Directors recommend a dividend at the rate of 5 per cent. per annum (free of income-tax) on the ordinary shares, and the usual dividend on the preference. This will absorb £4677 1s. 8d., leaving £487 7s. 3d. to carry forward.

Balance-Sheet, Dec. 31, 1879.

Dr.				Cr.			
Capital—				Concession			
5000 ordinary shares	£100,000	0	0		£7,000	0	0
1000 10 per ct. preference shares	20,000	0	0	Investment to June 30, 1879	105,024	4	1
1500 7½ do. do.	30,000	0	0	Additional during half year	18	8	1
Debentures	2,650	0	0	Freehold land	5,033	12	7
Creditors—				Meters fixed	2,470	12	5
On open accounts	637	10	5	Office furniture and fixtures	310	4	8
On acceptances	2,080	10	1	Preliminary expenses	16,914	17	3
Dividends unpaid	157	8	11	Amount due for gas, fittings, &c.—			
Debenture interest	77	16	10	Public lighting	1,638	7	10
Insurance-fund	47	4	10	Public establishments	2,399	9	8
Reserve-fund	2,500	0	0	Private rental, fittings, &c.	5,692	5	4
Profit and loss	5,164	8	11	Sundry debtors	44	4	7
				Stock—			
				Coals	4,809	13	4
				Coke	28	2	6
				Fittings	3,590	16	3
				Sundry other stores	2,901	13	1
				Goods in transit	851	12	3
				Bills receivable	4,000	0	0
				Cash at Bankers—			
				General account	109	0	9
				Dividend account	235	5	9
				London office	15	9	5
				London and Brazilian Bank	227	0	2
	£163,315	0	0		£163,315	0	0

Revenue Account, for the Half Year ending Dec. 31, 1879.

Coals carbonized	£5,498	14	8	Gas supplied to—			
Purifying materials and wages	170	17	0	Public lamps	£9,921	14	3
Carbonizing wages	1,118	13	6	Less fines	212	3	6
Wages, yardmen, &c.	264	11	5		£9,709	10	9
Repairs, &c., mains and services	158	12	9	Private consumers	7,023	6	9
Lighting and repairing public lamps	1,094	4	11	Public establishments	968	5	4
Salaries	969	3	9	Meter-rental	562	13	7
Directors fees	400	0	0	Products £2,509 14 3			
Auditors fees	21	0	0	Less labour 90 0 10			
Rent and taxes	227	6	7		2,419	13	5
Interest and discount	55	8	10	Transfer fees	2	12	6
Stationery	97	3	0	Profit on fittings	549	7	5
Office expenses	36	17	3	Bad debts recovered	34	15	8
Trade charges	212	6	2				
Travelling expenses	58	16	1				
Wear and tear	1,042	9	1				
Bad debts and allowances	299	19	4				
Exchange	1,375	13	1				
Law charges	17	0	1				
	£14,118	17	6				
Extraordinary disbursements—							
Renewal of mains, balance	3,476	1	10				
Balance—profit	3,675	6	1				
	£21,270	5	5		£21,270	5	5

Profit and Loss Account.

Dividends declared Nov. 6, 1879	£4,125	0	0	Balance, July 1, 1879	£5,693	12	10
Debenture interest to Dec. 31, 1879	79	10	0	Revenue account, net profit for the half year	3,675	6	1
Balance	5,164	8	11				
	£9,368	18	11		£9,368	18	11

The CHAIRMAN: There has been very little change in the business of the Company, further than a general progress towards putting itself in a better position, and being much more comfortably conducted than has been the case for some time past. On looking to the accounts and balance-

sheet, you will see the item of acceptances has alone diminished by £3850. About two years ago they were over £9000, while now they stand at £2080. On the other side of the account, you find that the capital has been increased. The money laid out, as compared with this time last year, is £1934 more; while the other items are considerably reduced—such as the money owing for public lighting, private rentals, &c. There is always some doubt in foreign countries whether you will get your money, and it is, therefore, all the more satisfactory to see these items so much reduced. The amount of stores is also considerably reduced. This item is always a source of some anxiety to us, who are a long way off. The value of the stores is exposed to so many contingencies that it is always agreeable to find the amount is less. The item of goods in transit is £1400 less, and altogether I think the items are of a favourable character, so far as the balance-sheet is concerned. With regard to the trading account, I think it is equally satisfactory, inasmuch as we find almost all the charges against the Company are less, with the exception of exchange. The rate of exchange is a matter over which we have no control. I am very sorry to say that the money lost in exchange in the last six months amounted to no less than £1875, or £912 more than this time last year, that sum alone being very little less than equal to 2 per cent. per annum. The exchanges are better than they were, but are still a subject of great loss to the Company. We are, however, obliged to submit to it, as we cannot help ourselves in the matter. On the other side of the account you will observe that there has been some increase in the business, though not very much. The increase in the public lights is £233 in the half year, and in private consumption £246, making together nearly £500, which is something; but there is a small diminution in the receipts from public establishments. Bahia, like some other places, has not been very flourishing. The amount realized for the gas is not quite so large as it was previously. This time last year it was 127s. 9d. per ton of coal; in June last it was 112s. 9d.; and now it is a little better than that—115s. 9d. You observe in the accounts that the extraordinary disbursements and the suspense accounts have entirely disappeared. I am very happy to say that the circumstances of the Company have been such that we have been able to entirely obliterate the extraordinary disbursements and write off the suspense accounts, and I hope that the amounts which have been deducted for this purpose for some years past will go to still further increase the dividends we are enabled to pay you on this occasion. The sum for suspense account, over and above what we have written off, amounted to no less than £2374, which we have cleared off entirely this half year, in addition to the ordinary sum; and if you add this to the profits made, the amount for the half year would be £6049. I therefore think that the accounts are highly satisfactory. Our liabilities are less, our assets are very good, and the business of the Company is increasing, though slowly. You will naturally expect me to make some reference to our position with regard to the Brazilian Government; but really matters have not at all changed since we last met. Fortunately for us we have not had occasion to send out any large quantity of piping, or anything that would have to pay duty; but we have not had any redress. We are, at any rate, no worse off than we were, and we hope, although there is no great prospect of it, that there may be some possibility of getting the matter fairly settled. We have been in communication with the Government, but have advanced no farther than we were before. I will move—"That the report and statement of accounts now submitted be adopted."

The DEPUTY-CHAIRMAN (Mr. H. Brothers) seconded the motion, and it was carried unanimously.

The CHAIRMAN then moved the payment of dividends on the 10 and 7½ per cent. preference shares in full, and at the rate of 5 per cent. on the ordinary shares, reminding the Shareholders that the latter compared with 4 per cent. last time.

The motion was agreed to.

Mr. BLUNDELL moved, and Mr. FOGG seconded a vote of thanks to the Chairman and Directors, and it was carried unanimously.

The CHAIRMAN having briefly responded, a vote of thanks was passed to the Secretary and the Auditors, and the proceedings terminated.

THE PURCHASE OF THE LINCOLN GAS COMPANY'S WORKS BY THE TOWN COUNCIL.

A Meeting of the Lincoln Town Council was held last Wednesday—the MAYOR (Mr. F. J. Clarke) presiding—"to consider the terms upon which the Directors of the Gas Company are willing to recommend the Shareholders to sell their undertaking to the Corporation; and, in case such terms shall be agreed on, to pass such further resolutions for carrying the sale into effect as may then be deemed necessary."

It has been already noticed in our columns that a Committee of seven members of the Council was, early in March, appointed to "consider and report as to the desirability of purchasing the works and property of the Lincoln Gaslight and Coke Company, by the Corporation as the Urban Sanitary Authority," and this Committee have just issued a short summary of their proceedings, setting forth the principal facts attending the negotiations with the Directors of the Company.

At the first meeting of the Committee, held on the 5th of March, the Clerk was directed to inquire whether the Company were willing to sell their undertaking to the Corporation; and, if so, on what principle they would agree to the purchase-money or equivalent being fixed. An opinion of counsel as to the powers of the Corporation under section 162 of the Public Health Act, 1875, was also ordered to be taken; and a Mr. Teesdale, an auditor, was requested to make a report on the financial condition of the Company, and on any other matters which he might think it would be useful to bring to the notice of the Committee.

After this meeting the opinion of Mr. Littler, Q.C., was taken, and he advised that as the Company's Acts of Parliament extended to places outside the city, there would be a difficulty in effecting a purchase of the undertaking under section 162 of the Public Health Act. An offer was also received from the Directors of the Company, and a report from Mr. Teesdale, which we give below. On the 15th of April these documents were considered by the Committee, and the Clerk was directed to inquire on what terms the Corporations of Birmingham, Leicester, and Nottingham had purchased the gas-works in those boroughs.

On the 3rd of May, the Committee resolved not to recommend the Corporation to purchase the undertaking of the Company on the terms contained in their offer, but they directed the Clerk to confer with the Solicitor of the Company, and endeavour to obtain an amended offer. The Clerk, therefore, had an interview with Mr. Dale, but he declined to advise the Directors to make any amended offer, and stated that, having made an offer, a counter proposition must come from the Committee.

On May 5, the Committee met, and the following resolution was agreed to:—"(1) That in the opinion of the Committee it is desirable to purchase the undertaking of the Lincoln Gas Company if reasonable terms can be arranged. (2) That in case the Gas Company are willing to transfer their undertaking and all their assets, including the reserve-fund, to the Corporation, in consideration of the grant by the Corporation of perpetual annuities (to be secured on the undertaking and gas-works, and collaterally by a charge on the general district rates), in amount equal to the maximum yearly dividends now payable on the several stocks and shares of the Company, and of the payment of the sum of £2500 in cash, as compensation to Directors and Officers as mentioned in the Company's offer, the Committee would be willing to recommend the Corporation to effect the purchase on those terms, the Corporation undertaking the Company's present bond debt (if any), and current liabilities reasonably incurred up to the time of transfer; but the purchase to be conditional only, and not binding, unless sanctioned by Parliament, and not unless the Corporation are satisfied with the state of the Company's works."

On the 10th of May, the following communication was received from the Directors of the Company:—"That the offer of the Lincoln Corporation Committee to purchase the undertaking of the Lincoln Gaslight and Coke Company be accepted, subject to the words 'which shall include the preference stock, representing £20,000, authorized to be raised by the Act of 1873,' being inserted after the words 'stock and shares of the Company,' in the resolution of the Corporation Committee of the 3rd or 5th day of May inst., and to the confirmation thereof by the Shareholders of the Company;" the Directors thus, in substance, agreeing to the terms suggested by the Committee, the improvement stock being a stock which they intended to include in their resolution.

The total maximum dividend paid on all the different shares and stocks of the Company amount to the yearly sum of £5024. By the terms proposed the Corporation will become entitled to all the Company's works, property, and effects, including the whole of their reserve-fund, by securing the payment of perpetual annuities to this amount (£5024) and paying £2500 in cash and the current liabilities of the Company. The £2500 the Corporation would be able to pay out of the reserve-fund to be handed over by the Company.

The minutes of the Committee concluded thus: "It will be gathered from what has already been stated, that the Special Committee are of opinion that, in case the Company's works are found to be in a satisfactory state, it will be to the advantage of the Corporation to effect a purchase on the terms contained in their resolution, and they have endeavoured to supply to each member of the Council the principal grounds and reasons for their opinion."

The following are the terms (signed by Mr. T. G. Dale, the Solicitor to the Company), considered at the meeting of the Committee on April 15, upon which the Company agreed to transfer their undertaking to the Corporation:—

Each £25 original share to bear interest at 5½ per cent. on £50.
Each £50 new share to bear interest at 5½ per cent. on £70.
Each £114 of improvement stock to bear interest at 5½ per cent.
The preference stock to continue at 5 per cent.

All shares and stocks to be redeemable at 25 years purchase of the interest after six months notice from the Corporation.

Value of each at 25 Years purchase.

£25 original shares . . .	£2	15	0	× 25 =	£68	15	0
50 new shares	3	17	0	× 25 =	96	5	0
114 improvement stock .	6	5	5	× 25 =	156	15	5
100 preference stock . .	5	0	0	× 25 =	125	0	0

The Corporation to create debenture stock to bear a fixed and perpetual interest at 4 per cent. per annum, payable half yearly, on £68 15s. for each £25 original share, on £96 5s. for each £50 new share, on £156 15s. 5d. for each £114 improvement stock, and on £125 on each £100 preference stock. The sum of £2500 to be retained by the Directors of the Company in compensation to the Directors and other Officers. The compensation to be paid thereout to the Clerk to be in lieu of, and in full satisfaction of an annuity or retiring pension which he might have received, or be entitled to, under clause 28 of the Bill now pending before Parliament. The costs, charges, and expenses of and incident to the obtaining and passing the Bill now pending before Parliament, and of the winding up of the affairs of the Company, to be first paid out of the profits of the Company. After retaining the sum of £2500, and paying the costs and expenses as aforesaid, the Corporation to take over the mortgage debts, if any, and also the liabilities and assets of the Company. The vendors and purchasers shall endeavour to obtain, in the present or future sessions of Parliament, powers authorizing and confirming the sale and purchase. If not confirmed on or before the 6th day of October, 1881, the sale agreed to be made shall on that day be determined null and void.

The report referred to above of Mr. E. Teesdale, the Auditor appointed to investigate the Company's undertaking, and submitted to the Committee on the 15th of April, was as follows:—

Statement of Capital.

320 shares of £25 each, dividend 10 per cent. . . .	£8,000	0	0
400 shares of £50 each, dividend 7 per cent. . . .	20,000	0	0
320 shares of £114 each, called improvement stock, dividend 5 per cent.	36,480	0	0
Preference stock, dividend 5 per cent.	20,000	0	0
Premium on sales of shares and stock not bearing interest	265	10	0
	£84,745	10	0

Spent in new buildings, plant, storeage works, and other structures connected with manufacture (capital account), 1875, £4177 10s. 1d.; 1876, £18,327 8s. 10d.; 1877, £848 6s. 11d.; 1878, £48 4s.

Spent in new mains and services, not being in place of old ones, laying same and paving (capital account), 1875, £738 2s.; 1876, £2105 17s. 8d.; 1877, £531 6s. 2d.; 1878, £152 0s. 11d.; 1879, £37 14s. 10d.

Spent in new meters, not in place of old ones (capital account), 1875, £494 6s. 3d.; 1876, £526 8s. 4d.; 1877, £266 7s. 8d.; 1878, £330 19s. 1d.; 1879, £235 3s. 7d.

Spent in repairs and maintenance of works and plant (revenue account), 1875, £964 1s. 4d.; 1876, £406 10s. 6d.; 1877, £855 16s. 3d.; 1878, £1155 4s. 8d.; 1879, £1507 19s. 6d.

Spent in repairs, maintenance, and renewal of mains, laying same and paving (revenue account), 1875, £312 6s. 5d.; 1876, £337 6s. 1d.; 1877, £660 10s. 4d.; 1878, £916 17s. 1d.; 1879, £526 4s. 1d.

Spent in repairing, renewing, and refixing meters (revenue account), 1875, £484 7s. 7d.; 1876, £253 5s. 7d.; 1877, £237 3s. 2d.; 1878, £325 13s. 2d.; 1879, £376 6s. 8d.

Received for gas, private lighting, 1875, £11,540 1s. 4d., at 3s. 9d. per 1000 feet; 1876, £12,370 2s. 5d., at 3s. 9d. per 1000 feet; 1877, £12,977 19s. 1d., three quarters at 3s. 9d. per 1000 feet, one quarter at 3s. 4d. per 1000 feet; 1878, £13,332 13s., at 3s. 4d. per 1000 feet; 1879, £14,056 0s. 7d., two quarters at 3s. 4d. per 1000 feet, two quarters at 2s. 11d. per 1000 feet.

Received for gas, public lighting, 1875, £1350 12s. 9d.; 1876, £1405 10s. 8d.; 1877, £1468 0s. 6d.; 1878, £1350; 1879, £1237 1s. 8d.

Received for rent of meters, 1875, £985 7s. 6d.; 1876, £1053 11s. 11d.; 1877, £901 19s.; 1878, £885 0s. 7d.; 1879, £932 4s. 9d.

Received for coke, tar, lime, liquor, &c., 1875, £3026 9s. 9d.; 1876, £3500 15s. 5d.; 1877, £3203 16s. 11d.; 1878, £4227 8s. 3d.; 1879, £4534 8s. 1d.

State of reserve-fund, 1875, £1725 10s. 10d.; 1876, £3374 15s. 11d.; 1877, £5360 19s.; 1878, £7795 9s. 10d.; 1879, £8457.

The reserve-fund now amounts to £8457. For 1879, there stands to the

credit of profit and loss account, £8709 1s. 9d., from which must be deducted the half year's dividends—viz., £2512, leaving a balance of £6197 1s. 9d., which sum added to the reserve-fund shows a sum of £14,654 1s. 9d. as accumulated profits (earned from July 1, 1873, to Dec. 31, 1879). The Shareholders cannot possibly obtain more than the specified dividends; all profit after paying the dividends must go to a reserve-fund. The reserve-fund can only be used for two purposes—(1) to make up the prescribed dividends in case the profit for the year should not be sufficient, and (2) to meet any extraordinary demand which may at any time arise. The Companies Clauses Act of 1845 gives power to the Directors to form a contingent-fund in addition to the reserve-fund. For all extensions the Company have to pay 7 per cent., whereas the Local Board can get money much cheaper. I believe the plant is in good working order, as during the last five years large sums have been expended in the maintenance of plant and mains. The Local Board would save £200 per year Directors fees, and £40 Auditor's fee, and I presume a very large proportion of the rates and taxes, which last year amounted to £532 8s. 9d., would not be paid by the Local Board. Mr. Throsby, the present Manager and Secretary, has £500 per year. I do not think the Local Board would be forced to reduce the price of gas like the Company is, but that could readily be known by applying to Birmingham and other towns; but if that is so, would not the gas consumer be providing benefits for the non-consumer? I am of opinion that the undertaking is a very valuable one, and have no doubt that £1500 or £2000, at the lowest computation, could be saved to the citizens every year, after allowing for another reduction in price.

Statement given after Gas Company's offer received by Corporation.

Annual sum now paid by the Company for dividends.

£8,000 at 10 per cent.		£800	0	0
20,000 ,, 7 ,,		1,400	0	0
36,480 ,, 5 ,,		1,824	0	0
20,000 ,, 5 ,,		1,000	0	0
	£5,024	0	0	
Price which Corporation would have to pay for works, as per Company's offer	£135,666	13	4	
Compensations	2,500	0	0	
	£138,166	13	4	
Annual sum to be paid by Corporation to Company, as per offer.				
320 shares at £50, at 5½ per cent.	£880	0	0	
400 shares at £70, at 5½ per cent.	1,540	0	0	
Improvement stock, 320 at £114, at 5½ per cent.	2,006	8	0	
Preference stock, £20,000, at 5 per cent.	1,000	0	0	
	£5,426	8	0	
Annual profit to Corporation in case purchase is made on above terms.				
Present profit, say, £2000 more than dividends	£2,000	0	0	
Deduct for increased dividends	402	0	0	
	£1,598	0	0	
Query—Directors fees saved £200				
,, Auditor's fee saved 40				

At the meeting of the Committee on May 5, Mr. G. W. Stevenson, C.E., and Mr. H. Teague, the Engineer of the Lincoln Water-Works, were instructed to examine and report upon the state of the Company's works; and the following report was subsequently received from Mr. Stevenson:—

38, *Parliament Street, Westminster, May* 24, 1880.

To the Mayor, Aldermen, and Burgesses of the City of Lincoln.

Gentlemen,—In pursuance of your instructions conveyed to me through Mr. Hebb, I visited Lincoln on the 21st and 22nd inst., and made a careful examination of the works belonging to the Gaslight and Coke Company, being accompanied by Mr. Throsby, the Engineer and Secretary, who afforded me every opportunity for making my examination, and furnished me with all such information as I required.

With regard to the capacity and condition of these works, I am happy to be able to assure you that they are in every respect satisfactory. The largest quantity of gas manufactured in any one day in midwinter has been, up to the present time, 650,000 feet; whereas the producing power of the retorts is equal to 1,040,000 feet. The condensing and purifying capabilities of the works are also equal to the producing power of the retorts. The storeage capacity is about 750,000 feet, which, it will be observed, is about one-seventh more than the present largest daily make, but about one-fourth less than the producing, cooling, and cleansing capacity of the works. The main-pipes are sufficiently large for present and immediately prospective purposes, and were in good condition until somewhat injured by the sewerage works of the city, which I am told have now been completed. The quantity of gas unaccounted for—by which I mean the difference between the quantity actually made, as registered by the station-meters, and the quantity actually paid for, as ascertained by the consumers meters and an estimate of the consumption of the public lamps—was, until the sewerage works commenced, as low as 6 to 7 per cent. It rose during the construction of the sewerage works to as much as 15 per cent., but is now being rapidly brought back to its normal condition.

The condition of the works, both in regard to the plant, machinery, and buildings, is almost equal to new; and this applies without limitation to every part of the works, except to four old purifiers at the Newland works, which ought to come out and be replaced by others, of equal or somewhat increased capacity, of modern design. This will cost about £800.

Mr. Hebb put me in possession of the terms offered by the Special Committee of the Corporation for the purchase of the Company's works and undertaking, and accepted by the Directors of the Gas Company, and has asked me to express my opinion upon the same. I am accurately informed of the facts in respect to every transfer that has taken place from gas companies to local authorities in recent years, and I am able to assure you that in no single instance have the terms agreed upon been so favourable to the purchaser as in this case. There is no bond debt to be taken over; the works are well designed, substantially erected, in first-rate condition, and larger than required for the business at the present time; the Company are able to pay maximum dividends with a very low selling price for gas, and when the leakage shall have been reduced to its normal condition, there will be a surplus profit of at least £2000 a year; a large sum, amounting probably to upwards of £10,000, will be handed over from the reserve-fund account, and yet you are only required to pay the proprietors maximum dividends in perpetuity.

I cannot do otherwise than congratulate you on the exceedingly favourable bargain you have made; feeling assured, as I do, that the purchase will be of very great advantage to the citizens for all time.

(Signed) George Wilson Stevenson, C.E., F.G.S.

The above reports and recommendations were first of all submitted last Wednesday to the Committee of the whole Council, when, after considerable discussion of the terms, the following motion was proposed:—"That the Council, as an Urban Sanitary Authority, be recommended to purchase the undertaking and all the assets of the Lincoln Gaslight and Coke Company, including the reserve-fund, in consideration of the payment of £2500 in cash as compensation to the Directors and Officers for the loss of their offices, and the guaranteeing of perpetual annuities amounting altogether to £5024, being the aggregate amount of the maximum dividends payable on the several shares and stocks of the Company, the Corporation agreeing to pay the current liabilities of the Company, reasonably incurred, up to the time of the transfer, and the annuities to be charged primarily on the gas-works and collaterally on the general district rates; but the purchase to be conditional on the sanction of Parliament." An amendment to adjourn the further consideration of the question till Friday was lost by 13 votes to 3, and the motion carried by a similar majority, after the Deputy Town Clerk had stated that if the matter was to go before Parliament this year there would not be time for the adjournment. It was also resolved—"That the Special Committee be empowered to purchase the Gas Company's undertaking, in the name of the Urban Sanitary Authority, and to do all such acts and things for carrying into effect the completion of the purchase aforesaid, and obtaining the sanction of Parliament thereto." The Council immediately afterwards held a special meeting in public, when their proceedings in committee were approved and adopted.

LEEDS CORPORATION GAS AND WATER SUPPLY.

The Association of Municipal and Sanitary Engineers and Surveyors met for their annual conference last week, the place of meeting being Leeds. The proceedings commenced on Thursday, when, after some preliminary business, the new President (Mr. A. W. Morant, M.Inst.C.E.) took the chair, and delivered an address containing a concise and comprehensive account of the principal undertakings of the Leeds Corporation, to whom he is Borough Engineer.

The parts of the address which will specially interest our readers are those concerning the gas and water works. About the former he said: The gas undertaking of the Leeds Corporation was purchased from two competing Companies in 1870, the price paid being 40 per cent. premium upon the stock and share capital of the Companies, the total cost to the Corporation being in round figures £800,000. Since the transfer there has been a further expenditure of about £150,000, the capital expenditure at the present time being £950,000. In 1870 the gas manufactured was 850 millions of cubic feet, and the sale 650 millions, the loss (including gas consumed upon the works) being 200 millions per annum. In the year ending June, 1879, the gas made amounted to 1250 millions, and the sale to 1063 millions, the loss (including use on premises) being 187 millions. The prices charged for gas per 1000 cubic feet have been as under:—1870 to 1874, 3s. 6d.; 1875 and 1876, 3s. 9d.; 1877, 3s. 3d.; 1878, 2s. 9d.; 1879, 2s. 6d.; 1880, 2s. 2d. The quality of the gas supplied, when tested by the "London" standard burner, is equal to an average of 18¼ candles. The length of mains is upwards of 500 miles, the area of lighting covering 35 square miles. The number of meters fixed is 68,777, of which about 85 per cent. are two and three light meters. The manufactories are three—viz., Meadow Lane, containing 792 retorts; New Wortley, containing 380 retorts; York Street, containing 380 retorts—total, 1552. The works at York Street have been almost entirely rebuilt under the direction of Mr. H. Woodall, the Gas Engineer, during the last two years, and their productiveness doubled, the whole cost having been charged against the revenue of the period. New works are also being erected at New Wortley for 400 retorts. The greatest daily make last winter was 6,200,000 feet, and the greatest quantity sent out was on Jan. 7—7,564,000 feet. The gas-holders are situated at Meadow Lane, Dewsbury Road, New Wortley, Kirkstall, Low Wortley, York Street, Stainburn Square, Sheepscar. They have a united capacity of 6 million feet. The largest holder station is at Sheepscar, about 1½ miles from the works at York Street, and 2 miles from those at Meadow Lane. There are two holders at this station, one 180 feet in diameter, and having a united capacity of 1,750,000 feet. At Dewsbury Road there was erected in 1878 a holder, 110 feet in diameter, having three lifts, which has worked most satisfactorily. The increase in gas made and sold for the year ending Dec. 31, 1879, was 100 million feet, which is equal to the largest increase in any one year at Manchester. The streets and roads are lighted by 7000 lamps, at a cost of about £2 7s. per lamp, each one burning 3½ cubic feet of gas per hour.

As to the water-works, Mr. Morant said: Leeds possesses an abundant supply of good wholesome water. The present consumption is at the rate of about 7 millions of gallons per day, of which nearly 2 millions are supplied for trade purposes, and the remaining 5 millions consumed for domestic purposes. The works belong to the Corporation, and are of the most substantial nature, no expense having been spared to make them efficient and durable in every way. The source from whence the water is procured is the River Washburn, a tributary of the Wharfe; and the point where the water is first impounded is about 15 miles from the town hall, measured in a straight line. In the valley are three large reservoirs for the storeage of water for the town's use and compensation for the mills. The drainage area from which these reservoirs are fed is about 22,000 acres, and the average rainfall is about 36 inches per annum. The most distant reservoir, known as the Fewston reservoir, has an area of water surface of 156 acres, and a capacity of 866 millions of gallons. The greatest height of bank is 68 feet, the inner slope is 3½ to 1 and the outer 4 to 1, with a benching 50 feet wide, with a slope of 3 to 1. The water is passed through the bank by means of a culvert 11 feet in diameter. The puddle trench varies from 20 feet to 70 feet in depth, and is 24 feet in breadth. The waste weir is 170 feet in width, and the bye-wash is 100 feet in width at the top, and tapers to 75 feet wide at the bottom. Swinsty reservoir, the next below, has also 156 acres of water surface, but a capacity of 961 million gallons. The greatest height of bank is 67 feet, and the water is drawn off by means of two lines of 30-inch pipes laid in a tunnel 12 feet diameter and 526 yards in length, driven in the solid rock round the east end of the embankment. At about the centre of the tunnel is the valve-shaft, which is 80 feet in depth. The embankment is 500 yards in length, 24 feet in width at the top, with inner slopes 3 to 1 and outer 2½ to 1, with a benching 80 feet in width. The puddle trench varies from 20 feet to 60 feet in depth, and the puddle is 8 feet wide at the top and 24 feet at the bottom. The waste weir is 165 feet in width, and the bye-wash 100 feet, tapering to 75 feet. The third on the line of the valley is the Lindley Wood reservoir. It has a water surface of 117 acres, and a capacity of 749 millions of gallons. The greatest height of bank is 67 feet, and the water is drawn off by means of two culverts through the embankment, each 10 feet in diameter, with valve towers and double valves. Very great difficulties were experienced and expense incurred at this reservoir, the puddle trench having to be excavated on the Farnley side of the embankment to a depth of 160 feet. A large landslip also occurred just below the north-east end of the embankment and alongside the bye-wash, and many thousand cubic yards of shale had to be removed. It was utilized by being added to the back of the outer slope. The embankment is about 360 yards in length. The waste weir is 160 feet in width, and the bye-wash 100 feet, tapering to 75 feet wide, and 880 feet in length. The excavation for this bye-wash was very heavy, the cutting

being 35 feet in depth. Swinsty reservoir is about 450 feet above sea level, and the water is conducted from it by two lines of 30-inch pipes, each about 12 miles in length, to the last storeage reservoir at Eccup. At present this has only an area of 45 acres, and a capacity of 250 millions of gallons; but an embankment is now being constructed 200 yards in length and 80 feet in greatest height, which will increase the area to 195 acres, and the contents to 1485 millions of gallons, so that the total capacity of the four reservoirs will be 4061 millions of gallons. One great advantage which will ensue from the enlargement of this reservoir will be that in case of accident to the works in the Washburn Valley there would be close to the town a supply of water equal to between six and seven months consumption, supposing that not a drop of water entered the reservoir from the Washburn. A further advantage consists in the greater time in which the water will have to become clear before being sent on to the filter-beds. It is worthy of remark that the Eccup reservoir alone, when enlarged, will be of greater capacity than the whole of the subsiding, storeage, and service reservoirs now in use for the supply of water to London. The filter-beds, seven in number, are situated at Weetwood, about three miles from the Eccup reservoir, and the water is conveyed to them in a conduit partly in tunnel under Black Moor and partly by 40-inch pipes. Here the whole of the water supplied to the town is filtered. The greater quantity gravitates to the town, and is distributed through three main-pipes, one of 30-inch diameter, and two each of 18-inch diameter, and the remainder flows to the well of the pumping-station at Headingley, from whence it is pumped to the high service reservoirs at Moortown and Bramley. There are also service reservoirs at Woodhouse Moor, Beeston, and Wortley, but these are filled by gravitation from Weetwood. At the junction of the Washburn with the Wharfe there is a gauge where the 4 millions of gallons of water which have, by Act of Parliament, to be passed into the Wharfe for compensation to the millowners, are measured, and 6 millions of gallons are also measured and sent forward by a 27-inch main to the pumping-station at Arthington. This is situated upon the side of the River Wharfe, from which river the Corporation have power to take 6 millions of gallons per day, and for five years pump this quantity into the Eccup reservoir, the lift being 260 feet. These works are now kept in case of any accident occurring to the works in the Washburn Valley, but at some future time, if the population largely increases, will be required to supplement the supply afforded by the gravitation scheme. The total cost of the water-works up to the end of the last financial year has been £1,343,634, but in spite of this the Corporation are able to give a constant supply of water at very moderate rates; for instance, a house the rental of which does not exceed £20 per annum is charged at the rate of 1s. in the pound; and one not exceeding £50, £2 per annum. Water is supplied for trade purposes by meter at the rate of 6d. per 1000 gallons. Mr. Hawksley has, in speaking of this price, remarked that so charged water is by far the cheapest commodity supplied to us, it being collected, filtered, brought 15 miles, and delivered into our houses for 1½d. a ton. At the end of August last 72,026 houses were supplied, and 11,522 water-closets.

WEST OF SCOTLAND GAS MANAGERS ASSOCIATION.

(*Continued from p.* 759.)

At the conclusion of the discussion on the amalgamation question, already reported in the JOURNAL, the reading of papers was proceeded with. The first was by Mr. D. C. NIVEN (Dunoon), on

THE ELABORATE AND TEDIOUS THERMOMETRIC AND BAROMETRIC CALCULATIONS RELATIVE TO COAL GAS SIMPLIFIED.

It is with some hesitation that I appear before you to give a paper, however brief, on one of the many ideas relating to gas, about which you are all so familiar. Frank and manly attempts at criticism always bring a reflex benefit upon all interested, and I hope that in the proper spirit you will not spare even this attempt.

The subject implies the use of two instruments now known to everybody. The thermometer measures heat, the barometer measures weight. In regard to the thermometer, it is a matter of dispute, and not yet decided whether it was an Italian or a Dutchman who had the honour of being the inventor; but be that as it may, its rudeness and imperfection required much thought to bring it to its present state of perfection. Now, at least, the mercurial thermometer consists of a tube having a fine bore hermetically sealed, and closing with a bulb, in which is the fluid. Mercury has such a wide range from its freezing point (– 39° Fahr.) to its boiling point (350° Fahr.), and also on account of its vaporization being exceedingly little at common temperatures, that its universal adoption is not a matter of surprise. Its principle of construction is that bodies change in bulk by an increase of temperature; and this is a general law of all homogeneous bodies, except water when near to the freezing point, when it then acquires its greatest density. Expansibility is, therefore, perhaps the most convenient effect of heat that could be selected as the means of its measurement. Whether heat be a kind of molecular energy or particles of a substance amongst bodies, does not at present much concern us, and the arguments *pro* and *con.* are such that many a learned man has been unable to give judgment.

In regard to the barometer, Torricelli, a disciple of the famous Galileo, gets the credit of not only being the inventor, but of also being the great refuter of the ancient doctrine that nature abhors a vacuum. It was an easy but lazy answer to the question why water would not rise more than 33 feet. The grand conception struck him that the atmosphere had some connection with it, and hence he was led in the course of thought to carry out the idea that if water can only rise 33 feet, then proportionally a heavier fluid—say mercury—would only require to rise according to its specific gravity. The idea was verified. Pascal, one of the most famous mathematicians of his day, heard of it, and he was led in the course of his thought to try whether, if the air be considered a kind of ocean, and the superincumbent strata being above the incumbent stratum, there would be greater density at the sea level than on a high mountain. The idea was verified on a high mountain. The nature of the air then became a profound study, and the explanation of many common phenomena was a matter of pleasing but profound surprise. The principle of the barometer in its construction is that there must be a vacuum in the tube, so that the air can only exert pressure from the outside, and thus be properly measured. For this purpose a tube some 33 inches long, closed at one end, is filled with mercury, and then plunged with the fingers closing the open end in a basin or vessel of the same fluid, so that the air is thus excluded from the tube. The mercury will sink to about 30 inches, and that height of mercury shows the weight of a column of air having the same sectional area as the tube. The weight of mercury is about 1 lb. in 2 cubic inches, so that about 15 lbs. to the square inch is the usual pressure of the atmosphere; and, if we consider for a moment that 2000 square inches are the sum total of surface over a man's body, it is easily seen how many tons weight a man must support.

Having given a rapid sketch of the thermometer and barometer, we require to consider a little their uses relative to coal gas. It would be impossible for us ever to compare gases with each other unless we brought them under like condition; accordingly, English writers consider that though the barometer ranges from 28 to 31 inches, yet its mean height is 30 inches. And this is confirmed by Continental philosophers; for, when their language is interpreted, their mean barometer height is only a fraction less. The thermometer is reckoned at 60° Fahr. The idea, however, is rapidly spreading that the freezing point should be the initial point for considering the mean, and hence the phrase is often used, even in English chemical text-books, of 0° Centigrade. Having now the conditions—namely, 30m. bar. and 60° Fahr.—the next matter is to take some gas as unity. Air is selected, and hence the specific gravity of coal gas is its ratio to air. The importance of corrections for pressure and temperature is obvious, for "supposing that gas were adjusted to burn at the rate of 5 cubic feet when the barometer was at 28 inches and the temperature at 84°, the measured volume of the normal value would be only 4·35 instead of 5 cubic feet." Unless there were some normal conditions, there could be no comparative commercial value in the analysis of coals. I have also often thought that if more use were made of the barometer and thermometer, more light might be thrown on certain points in regard to leakage or to a larger production per ton of coal in some parts of the country differently situated as to sea level.

The law upon which we must consider the action of the barometer is that the volume any gas occupies is inversely proportional to the pressure; that is to say, will be directly proportional to its density. The greater the pressure the greater the density. It follows, then, that simple proportion is the arithmetical principle involved in any barometric corrections.

I shall now quote from Mr. T. Newbigging's "Gas Managers Handbook," (p. 89) as exemplifying the usual way that such corrections are made:—

First Example.—Ascertain what volume 1000 cubic feet of gas at 28·5 inches will occupy when the mercury stands at 30 inches, the mean barometric pressure—

$$\text{Then } \frac{1000 \times 28{\cdot}5}{30} = 950 \text{ cubic feet.}$$

Second Example.—What volume will 1000 feet at 30·6 inches occupy at 30 inches?

$$\text{Then } \frac{1000 \times 30{\cdot}6}{30} = 1020 \text{ cubic feet.}$$

In regard to this last example, in case of any mistake, most persons would extend it thus—

$$\begin{array}{r} 1000 \\ 30{\cdot}6 \\ \hline 600{\cdot}0 \\ 30000 \\ \hline 30\,)\,30600{\cdot}0 \\ \hline 1020 \end{array}$$

There are here a good many figures. Now try this conception. Take the first example. The difference between 28·5 and 30 inches is plainly 1·5 or 15-10ths. Multiply each 10th by 3⅓, and add or subtract from 1000 as unity, according to whether you pass from a higher than 30 to 30 the mean, or the contrary.

(1) Thus: $(30{\cdot}0 - 28{\cdot}5) \times 10 = 15 \times 3\frac{1}{3} = 50$; then $1000 - 50 = 950$
(2) „ : $(30{\cdot}6 - 30{\cdot}0) \times 10 = 6 \times 3\frac{1}{3} = 20$; then $1000 + 20 = 1020$

I shall now refer to Mr. Wright's book, "The Analysis of Coal Gas," for corroboration of my results; and that there may be no confusion I shall assume the standard temperature of 60° Fahr.

		Tenths.		
1.	When the barometer is at 28·0 in.,	30 − 28 = 20	= 67,	then 1000 − 67 = 933
2.	„ 28·1 „	30 − 28·1 = 19	= 63,	„ 1000 − 63 = 937
3.	„ 28·2 „	30 − 28·2 = 18	= 60,	„ 1000 − 60 = 940
4.	„ 28·3 „	30 − 28·3 = 17	= 57,	„ 1000 − 57 = 943
5.	„ 28·5 „	30 − 28·5 = 15	= 50,	„ 1000 − 50 = 950
6.	„ 28·8 „	30 − 28·8 = 12	= 40,	„ 1000 − 40 = 960
7.	„ 29·2 „	30 − 29·2 = 8	× 3⅓ = 27,	„ 1000 − 27 = 973
8.	„ 29·4 „	30 − 29·4 = 6	= 20,	„ 1000 − 20 = 980
9.	„ 29·8 „	30 − 29·8 = 2	= 7,	„ 1000 − 7 = 993
10.	„ 30·4 „	30·4 − 30 = 4	= 13,	„ 1000 + 13 = 1013
11.	„ 30·6 „	30·6 − 30 = 6	= 20,	„ 1000 + 20 = 1020
12.	„ 30·9 „	30·9 − 30 = 9	= 30,	„ 1000 + 30 = 1030

I have given such a variety of examples, in order to show the ease and expedition with which it may be done. The fact is that no pencil is required for its calculation, only the simplest arithmetic.

I will now consider the correction for the thermometer. The coefficient of expansion of gases is, at 0° C., for every degree ·00366, or in vulgar fractional form $\frac{1}{273}$, or $\frac{1}{493}$ for each degree of Fahr.

Mr. Clegg gives the following formulæ:—

Let V be the volume of gas above 32°.
„ T „ the degrees above that point.
„ V „ its volume at 32°.

$$\text{Then } V' = \left(1 + \frac{T}{480}\right) \therefore V' = V\,\frac{(480 + T)}{480}$$

Now, evidently the first formula should have the letter V, and the second is defective as a formula; for there is implied a remembrance of some steps in the process which should have been indicated. For instance, the subtraction of the degrees of the freezing point should have been inserted. But, independent of the form, the factor 480 can now hold no place in the volume and temperature of gas. Therefore the formula is obsolete. Mr. Wright states the formula in a better manner, thus—

$$V = 1 + \frac{T - 32}{480} = \frac{480 + T - 32}{480} = \frac{448 + T}{480}$$

The factor 480 vitiates this also. I am rather surprised that I should read in Mr. Newbigging's "Handbook," "that all aëriform bodies expand 1-480th part of their volume for every degree of temperature above 32° Fahr." That it may not be considered that I am hasty in my remarks, let me quote Professor Roscoe: "It has been found by exact and laborious experiment that all gases expand 1-273rd part of their volume at 0° C. for every increase in temperature of 1° C." Dr. Letheby, in one of his lectures, says "that every gas expands 1-491·13th part of its bulk at 32° Fahr. for every degree of heat above that temperature." Professor Balfour Stewart says that "the dilatation of air between 0° C. and 100° C. is equal to 0·3665 of its volume at 0°." The proper formula for temperature therefore is—

$$V = Vo + \frac{Vo\,(T - 32)}{492} = \frac{Vo\,492 + Vo\,T - 32\,Vo}{492} = Vo\,\frac{460 + T}{492}$$

I shall now quote from Mr. Newbigging's "Handbook" the usual mode of correcting pressure. What volume will 1000 cubic feet of gas at 68° occupy at 60°, the mean temperature? A quantity of gas which at 32° is 480 parts will at 60° become 508 (60 − 32 = 28 + 480 = 508), and at 68° 516 (68 − 32 = 36 + 480 = 516); then $1000 \times 508 \div 516 = 984$ cubic feet; In consequence of the factor 480 instead of 492, the process is vitiated.

last I am desirous of drawing your attention to the labour and intricacy involved in this calculation, though, in fact, it is simpler than many that may occur.

I think a very simple plan is the following, and I have used Mr. Wright's book for correction. I have checked a number of the tables, and he is not always correct. I shall take the above example. 1000 feet at 68° Fahr., what should it be at 60° Fahr.? "Multiply the difference between the mean temperature by 2, and for every number of degrees that rise to a number between 20 and 30, add a unit to this product, and add or subtract it from 1000 as unity, according to whether the degrees of temperature be below or above the mean." That there may be no confusion, I assume the barometer at 30 inches, the standard.

1. 1000 feet at 32°, what should it occupy at 60°?

		$60 - 32 = 28 \times 2 = 56 + 1 = 57$	then	$1000 + 57 = 1057$
2.	„	34°, $60 - 34 = 26 \times 2 = 52 + 1 = 53$	„	$1000 + 53 = 1053$
3.	„	40°, $60 - 40 = 20 \times 2 = 40 + 1 = 41$	„	$1000 + 41 = 1041$
4.	„	46°, $60 - 46 = 14 \times 2 = 28$	„	$1000 + 28 = 1028$
5.	„	50°, $60 - 50 = 10 \times 2 = 20$	„	$1000 + 20 = 1020$
6.	„	56°, $60 - 56 = 4 \times 2 = 8$	„	$1000 + 8 = 1008$
7.	„	58°, $60 - 58 = 2 \times 2 = 4$	„	$1000 + 4 = 1004$
8.	„	64°, $64 - 60 = 4 \times 2 = 8$	„	$1000 - 8 = 992$
9.	„	68°, $68 - 60 = 8 \times 2 = 16$	„	$1000 - 16 = 984$

As the last one is the example taken from the "Gas Managers Handbook," it is easy to compare processes. The fact is that no pen or pencil is required for thermometric and barometric calculations.

We can continue the corrections thus:—

"To reduce 1000 feet at 29·5 in. bar. and 70° Fahr. to 30 in. bar. and 60° Fahr."

$70 - 60 = 10 \times 2 = 20$, then $1000 - 20 = 980$

$30 - 29{\cdot}5 = {\cdot}5 \times (3\tfrac{1}{3} \times 10) =$ 16

964

"To reduce 1000 feet at 29·1 in. bar. and 54° Fahr. to the standard."

$60 - 54 = 6 \times 2 = 12$, then $1000 + 12 = 1012$

$30 - 29{\cdot}1 = {\cdot}9 \times (3\tfrac{1}{3} \times 10) =$ 30

982

"To reduce 1000 feet at 30·6 in. bar. and 74° Fahr. to the standard."

$74 - 60 = 14 \times 2 =$ 28 then $1000 - 28 = 972$

$30{\cdot}6 - 30 = {\cdot}6 \times (3\tfrac{1}{3} \times 10) =$ 20

992

These examples are quite sufficient as illustrations. I have not had time to fully formulate these rules, but possibly their simplicity makes it needless. I may state, however, that in regard to temperature, I start as the initial rise of volume, not at the freezing point, as is the usual case, but at the mean of 60° Fahr. The following formula is the basis of my rule for corrections of temperature:—

$$\text{Let } Vo \frac{(60 - T)}{492} = \text{increase for every degree Fahr.}$$

$$\text{Then } V = Vo + \frac{Vo\,(60 - T)}{492} = \frac{Vo\,(552 - T)}{492}$$

Or in arithmetical form thus:

Problem: "1000 feet at 50° Fahr., what is the volume at 60° Fahr.?"

$$V = \frac{Vo\,(552 - T)}{492} = \frac{1000\,(552 - 50)}{492} = \frac{1000 \times 502}{492} = 1020 \text{ feet.}$$

I find, in comparing Wright's tables with Dr. Letheby's, which he produced in his lecture on "Coal Gas," that there is a difference of sometimes 2 units; for example, in the one the number may be 1000, and in the other 1002. I am completely at a loss in regard to the appendix to Mr. Hartley's "Gas Analyst's Manual," for I am unable to follow them; and yet he says what Mr. Wright says of his tables: "Multiply the quantity of gas by the tabular number (Table C, Appendix) due to temperature and pressure, strike off the three right-hand figures, and the remainder is the true bulk." Surely these words convey the idea that the table can be used for corrections of temperature and pressure; and yet, if that be so, there are at least apparent mistakes. The difficulty I feel is that a goodly number of the figures coincide, while others do not. If there were some factor at work that was regular in producing results, it would be plain I had not grasped it; but in regard to tables like these, it is difficult to conceive of an intermittent factor. Mr. Hartley is, in general, such a clear writer, that his present obscurity requires elucidation.

Had time permitted, I purposed in my paper entering more fully into the different kinds of thermometers and barometers; but I dare say you will now feel that the subject has been dry enough.

Discussion.

The PRESIDENT: We are all much indebted to Mr. Niven for showing us this short cut. I know he has been experimenting for a considerable time with these calculations, and it is not matter for wonder that with his knowledge of figures he should have succeeded in discovering errors in the present modes of calculations, and be able to point to a simple mode of correction.

Mr. S. STEWART (Greenock): I am sure we are greatly indebted to Mr. Niven for his useful calculations. It is important to have these matters simplified as much as possible, and his method of treatment renders these calculations easier. The determinations of temperature and barometric pressure are absolutely necessary in testing gas for the purpose of making a comparison of quality at different times; but if these tests were made several times a day, the corrections would be scarcely necessary. Where a gas of, say, 28 candles is supplied, it should simply be stated to be so, without any corrections. I think Mr. Niven deserves our warmest thanks for the calculations he has made, and the trouble he has taken in expounding them, because it is of importance to have a correct form. The tables that give the co-efficient of 480 ought to be corrected to the extent he has indicated. I beg to move a vote of thanks to Mr. Niven.

Mr. NIVEN: In regard to these two rules, I had not time to formulate them, and it is difficult in a public meeting to give the algebraical formula. What I have shown is the results at which I have arrived, and the simple process by which that end is attained. All intricate and roundabout ways are obviated by this method.

Mr. M'GILCHRIST: I also have to thank Mr. Niven for his paper, which I think has been very instructive. He has shown us a remarkably short cut to make these calculations. What I would suggest is that Mr. Niven should publish a card such as that issued by Messrs. Wright, Sugg, Cowan, Grant, and other photometrical apparatus manufacturers, which shows at a glance the tabular number by simply noting the temperature and barometric pressure. As I understand, at the present time comparatively few managers make the calculations Mr. Niven has referred to. For my part, the table being fortified by excellent authority, I never question its accuracy. If Mr. Niven can show by the alterations he suggests that they would make any appreciable difference in the illuminating power of the gas, it would be very creditable to him and also to this Association, at which the paper has been read. Mr. Niven has brought forward in his paper other points worthy of consideration, such as the variations in the volume of gas at the level of the sea and on a high hill, and one cannot help seeing that the people of Dunoon must be getting a smaller yield per ton than people living in such places as Lanark. This is an interesting question, and branches off in many directions. I second Mr. Stewart's motion.

The motion was agreed to.

(To be continued.)

THE PUBLIC LIGHTING OF PARIS.

It will be remembered that at the meeting of the Paris Municipal Council on the 26th of February last, a report was presented by M. Cernesson, on behalf of the Third (Streets and Lighting) Committee, recommending the continuance of the electric light in certain parts of the city for a further period of twelve months from March 1, and at the same time suggesting the curtailment of the improved system of gas lighting then in use in the Rue du Quatre Septembre. The Committee were of opinion that one-half the burners in this street might be dispensed with, and probably also the consumption of gas in them reduced. They, however, asked the Council to allow them to further consider the matter in conjunction with the Administration, promising to make known their proposals at an early date.

At the meeting of the Council on Thursday, the 13th ult., M. Cernesson stated that the Committee recommended the Council to temporarily discontinue the trials of improved gas lighting in the Halles Centrales; to continue the lighting as at present in the Place du Château d'Eau; to reduce by one-half the number of burners in the Rue du Quatre Septembre; and to adopt the improved system of gas lighting for the refuges in the Champs Elysées, the inner boulevards, the Place St. Michel, and certain open spaces to be hereafter indicated by the Committee, with the concurrence of the Administration.

The recommendation was agreed to.

THE LANCASHIRE COAL AND IRON TRADES.

(FROM OUR OWN CORRESPONDENT.)

During the past week the coal trade of this district has only been gradually settling down to its usual course after the holidays, many of the pits not having their full complement of men at work as late as Wednesday and Thursday last. There is not, however, any indication of improvement, and for all descriptions of round coal the demand continues extremely dull. House coals move off slowly, and as the iron-works in this district are, as a rule, only kept going on orders secured some time ago, without any fresh ones coming in, the demand for common round coals for forge purposes is also very dull. In the gas coal trade, the tendency, as I have pointed out in previous reports, is decidedly towards low prices. I do not hear of any important contracts having been concluded as yet; but the tenders have now been sent in for the Manchester Corporation Gas-Works, and they are in process of being sent in for Salford. Although nothing definite is yet known as to the prices, I hear that tenders are being sent in freely at low figures; and although some of the large firms are not willing to go beyond the next twelve months, there is no difficulty in obtaining offers for much longer forward deliveries. For good screened cannel at the pits in the Manchester district the quotations range from 13s. 6d. to 16s. per ton, and for good Lancashire screened gas coal from 6s. to 7s. per ton, according to quality; but whether these represent the lowest prices at which tenders will be placed is very doubtful. For round coals generally prices are weak, and there has been some talk of a reduction of the list rates in the Manchester district with the commencement of June; but the leading firms have decided not to make any alterations at present, and quotations remain nominally the same as those given last week. Engine classes of fuel, although still moving off without difficulty, are in less pressing demand, and the advanced rates which were asked about a month ago are not being maintained to the full extent. For good burgy at the pit mouth not more than about 4s. per ton is being obtained, and good slack averages about 3s. 6d. per ton.

For coke the demand continues dull, but prices are without material change; Lancashire cokes at the oven being quoted at from 10s. to 13s. per ton.

The iron trade continues in a very depressed condition, and to secure orders sales have to be forced at under current rates. Lancashire makers of pig iron being unable to secure fresh business, are reducing their output, and another of the local furnaces has been blown out. Nominally, then, quotations for delivery into the Manchester district are still 52s. 6d. per ton, less 2½ per cent. for foundry and forge qualities; but 50s. per ton would be taken if offers were made. Local finished iron makers, who, although in most cases well sold, are unable to get in specifications, are pressing for orders at very low figures, and bars delivered into the Manchester district could be bought at from £6 15s. to £6 17s. 6d. per ton.

THE SOUTH STAFFORDSHIRE COAL AND IRON TRADES.

(FROM OUR OWN CORRESPONDENT.)

As indicated in last week's report, a general alteration of prices in both raw and finished iron has been the characteristic feature of the business operations in the South Staffordshire district during the past week. Both at Wolverhampton, on Wednesday, and Birmingham, on Thursday, sellers were unanimous in quoting a reduced price of £1 per ton, both on branded and unmarked iron. It is now apparent that prices were unduly forced up at the commencement of the year, and it is considered doubtful if the market has yet found its proper level. The coal trade is, consequently, in an unsettled state, and though no reduction has as yet taken place, a decline is looked upon as certain, whilst buyers hold that there must be a reduction of 1s. per ton. Orders have been given out rather more plentifully during the last few days, though they are in most cases not of a noteworthy class, and emanate from customers who have been withholding in anticipation of a falling market. In the gas coal department matters are looking more favourable, and there is a decided movement noticeable for the better. At most of the collieries the output is greater, and some good contracts have been given. There are, too, a fair number of inquiries, while several local tenders are in the market. Amongst the latter may be mentioned the requirements of the Birmingham Corporation. They are contracting for 200,000 tons, to be placed in lots. The Walsall Corporation are seeking a supply of 24,000 tons, and the West Bromwich Improvement Commissioners a supply of 9000 tons, each to be delivered over within one year. A good demand exists for house coals, especially for the Cannock Chase production. From that district a good export trade is reported. Furnace fuel is plentiful, though prices are unsatisfactory to masters. Some of the pits in this district which have so long been water-logged are said to be in an improved state, though the mines drainage scheme does not work so satisfactorily as could be wished. Another favourable feature of the improved state of mining operations in this locality is found in the report of the Pelsall Coal and Iron Company,

which has just been issued. The profit of the Company for the last half year is shown to have been £8829 14s. 8d., as against £219 10s. 2d. in the previous corresponding period. The results are owing to the increased output of coal and iron, and to a higher rate of prices obtained for the same. Operations are now in hand, and are being eagerly pushed forward, for the opening of the Great Wyrley coal mines, and in a very short space of time the machinery for the same will be in perfect working order. Notwithstanding the anticipated reduction, the tonnage raised at nearly all the pits in this district shows no signs of decrease, but rather the contrary, for most of the largest colliery proprietors are increasing the output, and a difficulty is, moreover, experienced in meeting the immediate wants of customers. Engine coal is in good request, and if the slight diminution in the demand for iron-making qualities is excepted, trade is fairly active and prosperous.

The downward movement in the iron trade leaves prices much as follows:—Marked bars, £8; sheets and plates, £10; though the commoner sorts are plentiful, and may be purchased as low as £8 and £7 10s. Hoops are quoted at £9, and tees at £10. Unmarked bars are offered at as low as £6 10s. and £7, and there are plenty in the market to be purchased even lower. The outlook is perhaps best in finished iron, as the export trade in this branch is the most brisk and promising. The price of labour has been reduced in proportion to the reduction in material—say, 1s. per ton, or 10 per cent. Heavy ironfounders and makers of tubes are doing a steady trade.

THE YORKSHIRE COAL AND IRON TRADES.

(FROM OUR OWN CORRESPONDENT.)

The iron trade of this district does not seem to be quite so active as it was, producers of iron being affected by the reduction of prices in South Staffordshire. The finished iron trade is quieter than it was, and many of the local foundries are not over well off for orders. Most of the mills and furnaces used for puddling purposes are kept fairly at work, but fitters and engineers are not so well employed as they were a short time ago. No falling off can as yet be noticed with respect to the output of pig iron, the blast furnaces being still fully at work. Makers of Bessemer steel rails, tires, and axles are doing a fair business, the works at Penistone and elsewhere having a tolerable number of orders on their books. Very little ironstone is being raised at the district pits, the supplies for the most part coming from the neighbourhood of Frodingham, in Lincolnshire.

The house coal trade, if anything, is quieter, whilst prices were scarcely ever so low. The demand for the Metropolis is practically at a stand, owing to the high tonnage rates imposed, 8s. 4d. being charged to London, including City dues. Coalowners in Yorkshire find it utterly impossible to compete with seaborne coal, but the railway companies decline to reduce the rates.

On the other hand, steam coal is in better request, and a large quantity is being sent to both Hull and Grimsby for shipment to the Baltic and other ports. Some pits, including Mitchell's Main, Wombwell Main, and other large concerns, are doing a very good business, chiefly with Grimsby, from which port the shipments of late show a considerable increase. The demand for hard coal for smelting purposes holds well up. The railway companies are drawing large supplies of locomotive coal from the South Yorkshire district, Manvers and Denaby Main Collieries supplying a fair share of the Great Northern contract.

A fair business is being done in gas coal at many of the leading collieries, whilst manufacturing fuel for Yorkshire and Lancashire is rather better to dispose of. Not nearly so much slack and small coal is in the market, owing to the large consumption for coke-making purposes. It may, however, be stated that the make in a short time will be so materially increased that it is feared the market will be overstocked. A great bulk of the coke at present produced in South Yorkshire is being sent by rail to North Lincolnshire.

THE COAL AND GENERAL TRADES OF THE NORTH OF ENGLAND.

(FROM OUR OWN CORRESPONDENT.)

The general coal trade of the North of England was in a more active and healthy condition last week. The demand for best gas coals for shipment was very well upheld, and the prices for these coals are about as quoted—viz., 7s. a ton. More steam coals were shipped last week than usual. There were somewhat large cargoes for the Baltic. Boats have been freighted to take out gas and steam coals to Cronstadt, and they have loaded up pretty quickly. Merchants in this country made some large contracts to supply gas and steam coals to St. Petersburg, Moscow, and some of the other large Russian gas companies, to be delivered before the close of the first half of 1880. These contracts they have now on hand, and it is pretty clear the contractors will have to pay more money in freight than they anticipated they would have to do. The shipments of gas coals coastwise and to the Mediterranean were pretty good last week. There was considerably more than the average arrivals of small coasting vessels in the Tyne. Several of them were what is known as "gas-house ships," or were vessels which had been chartered to load gas coals in the Tyne before they left the South. The sailings have been considerable. Sailing ships had been taken up last week to load gas coals for Wexford, Cork, Sligo, and other Irish ports at low rates; and 7s. per ton was offered a 2500-ton steamer to load gas coals for Dublin, the steamer to be employed twelve months at the same rate. Steam coals have been more inquired after. The shipments from the Tyne have been numerous. Recent prices are well upheld. The official price of coke will be reduced on the 1st of June; the figure for best sorts will then be about 15s. per ton. The local demand for manufacturing coals is steady. Prices are very well supported.

Gas, water, and sanitary pipes were shipped to the Continent last week; but none of the parcels which were exported were large. The iron foundries are short of orders in some instances. The manufactured iron trade of the North has hardly come up to expectations. The only branches of the iron business which can be called busy, are the iron shipbuilding and the marine engine trades, and they undoubtedly are very active. The business which is doing in fire-clay goods is very well sustained. Shipments continue to be general. The value of lead is unchanged. The timber business is quiet. The trade does not improve very rapidly. Prices remain unchanged.

The freight paid sailing vessels to load gas coals for Sligo is 7s. per ton; to Weymouth, 5s. 6d.; Plymouth, £5 5s. and £5 10s. per keel; Poole, 5s. 9d. per ton; Cork, 5s. 3d.; Rotterdam, £6 per keel; Dover, 4s. 3d.; Teignmouth, 6s. and 6s. 1½d.; Totnes, 7s. 3d.; London, for steamers, 3s. 10½d. per ton. Small sailing ships are taking low freights to load bricks and other general cargoes for the Thames.

TRADE NOTES FROM SCOTLAND.

(FROM OUR OWN CORRESPONDENT.)

At a meeting of the Finance Committee of the Dundee Gas Commissioners, held last Thursday, the annual accounts were submitted and examined, and it was found that there was a surplus of upwards of £1000 for the year just ended. Notwithstanding the increase in the price of coal, the Committee did not find it necessary to increase the price of gas, and the present charge will remain in force during the current financial year. That charge, it may be remembered, is 3s. 8d. per 1000 cubic feet, subject to an abatement of 5 per cent. when payment is made within 28 days.

The Directors of the Buckie Gas Company have resolved to reduce the price of gas from 10s. to 9s. 2d. per 1000 cubic feet, and to allow the usual discount of 5 per cent. for prompt payment.

A special meeting of the Forfar Gas Corporation was held last Friday week, for the purpose of receiving the recommendation of the Committee as to the extent of the additional borrowing powers that should be asked of Parliament in the Provisional Order. This recommendation was that the sum asked for should be £5000; and in supporting it Bailie Laird, the Convener, urged that the Commissioners were already £3000 in debt, and that when the present extension was made, it would be a permanent debt, being money sunk in the shape of permanent plant. He had looked closely into the bank account, and had found that it had been regularly overdrawn every year to a considerable sum. His private opinion was that they ought to ask a much larger amount, but he hoped that they would not at all events go below £5000. If they did, he predicted that in less than three years they would see their mistake. His motion to approve of the recommendation was not seconded, and it consequently fell. Provost Lowson moved that the sum be restricted to £4000, and after some discussion this motion was agreed to—Mr. Craik dissenting, on the ground that the money was unnecessary, and Bailie Laird, because he thought the sum was inadequate. Mr. Grant, in the course of the discussion, said he had watched the management of the gas-works very closely ever since the transfer, and his opinion was that they had been most admirably managed; but in reference to the financial part of the business he had a widely different opinion. If they had kept to the letter of their Act, in respect of the contingent and sinking funds, they would not have needed to borrow money at the present time; and if they had kept up the price of the gas, as they ought to have done, they would have been in a position which would have enabled them to lower it by this time.

On Friday week three shares of the Montrose Gaslight Company were put up for sale by public auction at £53 10s. per share, and were purchased for £53 15s. each. The stock consisted originally of £20 shares, and the last dividend was £3 per share. The ordinary market price on the following day was £51 10s.

Glasgow Corporation 9 per Cent. Gas Annuities were sold last Friday at £218 10s; Edinburgh Gas Company's Stock was sold on Tuesday at £45 10s. per share, and on the previous day at £45 15s.; and on Tuesday the stock of the Edinburgh and Leith Gas Company changed hands at £30 10s. per share.

Loud complaints are being made of a somewhat extraordinary line of policy which is being carried out by the Police Commissioners of the burgh of Falkirk. A few weeks ago they resolved that there should be no street-lamps lighted at night, and that not even the town clock should be illuminated, and at a meeting which they held last Thursday they agreed to cut off the water supply from the town during the night.

A considerable amount of energy is being displayed by Messrs. Scott and Best, the contractors for the new water-works which are in progress for the town of Forfar. The collecting-ground and the principal reservoir, in the Den of Ogil, are about 10 miles from the town, and about 600 feet above sea level; and the service reservoir, about 2¼ miles from the town, is 500 feet above the sea level, and 100 feet above the highest house in the town which has to be supplied. The works are being constructed at present for a supply of 30 gallons per day to a population of 20,000, and the estimated cost is set down at £38,000.

There is still much public alarm in Perth in regard to the widespread epidemic of diarrhœa which has prevailed in that city during the last few weeks, and to the great fatality to which it has led. In the opinion of the leading medical men of the city there is now no doubt as to the disease having been spread through the medium of sewage-contaminated water, as was very pointedly stated at a special meeting of the Police Commissioners held on Monday last week for the purpose of receiving a deputation of the doctors in regard to the matter.

Last week's Glasgow pig iron warrant market was very steady, and a fair amount of business was done daily. The highest price was 45s. 7d. cash (paid on Monday), and the lowest was 45s. 0½d. At the close on Friday afternoon there were sellers at 45s. 4d. cash, and buyers at 45s. 3d. Makers prices have again been reduced, but there does not seem to be any accession of business in consequence.

No change for the better can be reported in the coal trade. There is a keen competition for any good orders that are going, and wages are being reduced all round.

SALE OF GAS AND WATER COMPANIES SHARES AT NEWCASTLE.—There have recently been sold by auction, at Newcastle, a number of shares in some of the local gas and water companies, and very good prices realized in all cases. The following are the particulars of the sales:—

Hartlepool Gas and Water Company—

A shares,	£5	paid,	sold for	£6 17s. to £7 0s. 6d. each.
B	„ £5	„	„	£6 3s. 6d. each.
C	„ £5	„	„	£6 7s. 6d. each.
£10	„ £10	„	„	£12 12s. to £12 16s. each.

Newcastle and Gateshead Water Company—

Ordinary £100 stock sold at £123 2s. 6d. each.
£5 guaranteed preference shares sold at £5 17s. each.
£5 preference, 1876, shares, £3 10s. paid, sold at £4 8s. each.

Sunderland Gas Company—

Ordinary £100 stock sold for £191.
£5 preference shares, bearing 5 per cent. dividend, sold at £9 14s. 6d. and £9 15s. each.

PADIHAM CORPORATION GAS SUPPLY.—The working statement for the year ending March 25 last furnished to the Padiham Corporation by the Manager of their Gas-Works (Mr. J. R. Smith) contains the following particulars:—

Gas made	18,736,100 cubic feet.
„ sold	16,675,550 „
„ for public lighting	848,085 „
„ used on works	191,000 „
„ unaccounted for	1,021,365 „
Capital employed	£25,065 6 10
„ per ton of coal carbonized	12 14 2½
„ per 1000 feet of gas sold	1 8 7
Illuminating power required by Act of Parliament	14 candles.
„ supplied	16 „
Gas made per ton of coal	9510 cubic feet.
„ accounted for per ton of coal	8933 „
Cost of coal per ton, in works	11s. 5d.
Coke, tar, and liquor realized per ton of coal	5s. 0½d.
Net cost of coal per ton	6s. 5d.

For the year ending March 25, 1879, there were 1985 tons of coal carbonized, in respect of which 16,700,200 cubic feet of gas were accounted for, while last year 1972 tons were carbonized, and 17,714,735 cubic feet of gas were accounted for.

SALE OF STOCK AND SHARES IN THE TUNBRIDGE WELLS GAS COMPANY.—On Friday, the 21st ult., some exceptionally good prices were realized at a sale by auction of stock and shares in the Tunbridge Wells Gas Company, the property of a gentleman deceased. Four lots of £100 consolidated ordinary 10 per cent. stock sold three at £200 and one at £201. Five lots of consolidated B stock, with a 7½ per cent. dividend, sold for £149, £149 10s., £150, £150 10s., and £151 respectively; while £140 of similar stock sold for £211. Two lots of ten £10 shares, fully paid, entitled to 7 per cent. dividend, sold at £145 10s. and £147. At the same sale ten £5 shares, fully paid up, in the Southborough Gaslight and Coke Company, Limited, were disposed of for £82.

Register of Patents.

APPLICATIONS FOR LETTERS PATENT.

2065.—SUGG, W. T., Westminster, "Improvements in railway-carriage lamps, and in the means of supplying illuminating gas thereto." May 21, 1880.

2135.—LIVESEY, J., Westminster, "Improvements in apparatus for enriching gas by admixture of hydrocarbon vapour." Partly a communication. May 25, 1880.

PATENTS WHICH HAVE PASSED THE GREAT SEAL.

4901.—HEARSON, C. E., Southwark Street, London, "Improvements in gas governors or regulators." Nov. 29, 1879.

5197.—HADDAN, H. J., Westminster, "Improvements in the mode of purifying gas." A communication. Dec. 19, 1879.

619.—KROMSCHRÖDER, J. F. G., Prince of Wales Road, London, "Improvements in the manufacture of coal gas for lighting purposes." Feb. 12, 1880.

1162.—WILSON, W., Oakland, U.S.A., "An improved collapsible tube-valve, to be placed in pipes and passages for admitting a flow of water, steam, air, or gas in one direction, and preventing a back-flow in the opposite direction." March 18, 1880.

PATENTS WHICH HAVE BECOME VOID

BY REASON OF THE NON-PAYMENT OF THE ADDITIONAL STAMP DUTY OF £100 BEFORE THE EXPIRATION OF THE SEVENTH YEAR.

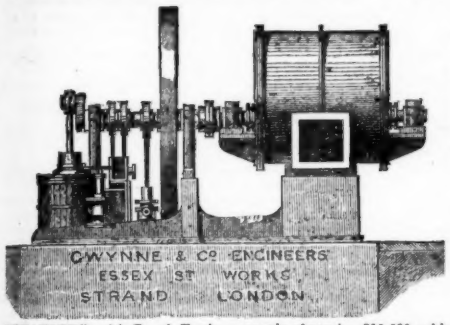
1579.—DAVIES, P. J., "Improvements in apparatus for controlling, regulating, measuring, and arresting the flow or discharge of fluids or liquids, and preventing waste thereof." May 2, 1873.

1637.—CASTRO, D. DE, and BURTON, R., "Improvements in gas-meters." May 6, 1873.

1799.—CAFFALL, R. M., "Improved means of and appliances for automatically preventing the back-rush of gas from gasometers, for purifying the gas, and for improving the brilliancy of the lights or flames of gas." May 17, 1873.

The GRAND MEDAL of MERIT at the VIENNA EXHIBITION, TWO MEDALS at the PHILADELPHIA EXHIBITION and TWO MEDALS at the PARIS EXHIBITION, have been AWARDED to GWYNNE & CO. for GAS-EXHAUSTERS, ENGINES, and PUMPS; Also 27 OTHER MEDALS AWARDED at all the GREAT INTERNATIONAL EXHIBITIONS.

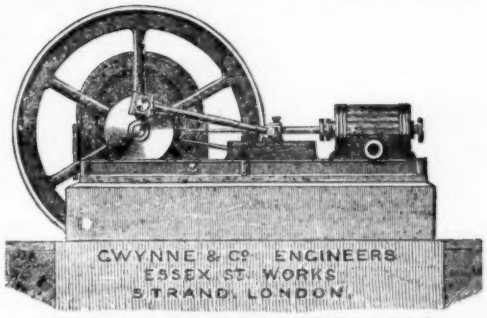
GWYNNE & BEALE'S PATENT GAS-EXHAUSTERS & ENGINES.



EXHAUSTER with Trunk Engine, capable of passing 210,000 cubic feet per hour.

The Judges report on the combined Exhauster and Steam-Engine exhibited at the Philadelphia Exhibition is—"*Reliable compact Machine, well adapted for the purpose intended, of excellent workmanship.*"

GWYNNE & CO. have made the largest and most perfect Gas-Exhausting Machinery in the world, and have completed Exhausters to the extent of 8,000,000 cubic feet passed per hour, of all sizes from 2000 to 210,000 cubic feet per hour.



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GWYNNE & CO. do not pretend to enter into a struggle with other makers in respect to cheapness. They have never sought to make price the chief consideration, *but to produce machinery of the very highest quality, and most approved design and workmanship.* The result is that in every instance their work is giving the fullest satisfaction. Numerous testimonials and references can be given to Companies using their Machinery for years past.

Exhausters, with or without Engines combined, can be made to pass the gas WITHOUT OSCILLATION OR VARIATION IN PRESSURE Regulators, Bye-Passes, Stop-Valves, Gas-Valves, Station Governors, and Gas Machinery of all Sizes.

PLEASE ADDRESS IN FULL, GWYNNE & CO., Hydraulic and Gas Engineers, ESSEX STREET WORKS, VICTORIA EMBANKMENT, LONDON, W.C., ENGLAND.

Gwynne & Co.'s New Catalogue on Gas-Exhausting and other Machinery may be obtained on application at the above Address.

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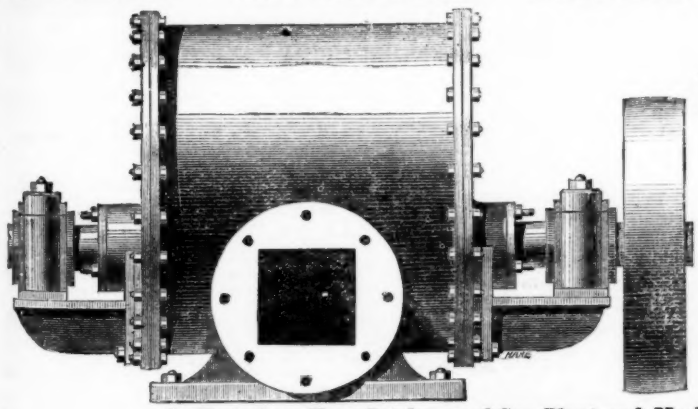

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PRECEDENTS IN PRIVATE BILL LEGISLATION

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WANTED, Readers of the NEW Edition, "Cooking & Heating by Gas;" on Burners, &c. Copies, by post, Threepence, direct from the Author, MAGNUS OHREN, Assoc.M.I.C.E., Gas-Works, SYDENHAM.

WANTED, a Situation as Foreman of Chemical Works. Understands Tar Distilling and Treatment of Products; also Liquor and Sulphate of Ammonia Making.
Address No. 662, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

A GENTLEMAN, nearly four years Assistant Engineer on Gas-Works producing over 200 millions, desires a similar engagement, or the Management of a Works.
Address G. D., 1, St. George's Villas, Beckenham, KENT.

YOUNG MAN (aged 25) is desirous of obtaining, at Home or Abroad, the Management of a small Gas-Works, or Assistant in a larger Works. Has had several years experience as Manager and Secretary. Unexceptionable references and testimonials, and satisfactory reasons for change.
Address, in first instance, No. 663, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, by the Lytham Improve- ment Commissioners, a steady, sober man as STOKER at their Gas-Works. Wages 28s. per week (throughout the year).
Apply to Mr. BOWER, Gas Offices, LYTHAM.

RIPON CITY GAS-WORKS.

WANTED at once, for the above Works, a steady, competent Man as FITTER and METER INSPECTOR. Wages 30s. per week. One with a knowledge of Water-Meters preferred.
Apply, stating age, with references, to
JNO. S. IRESON, Manager.

GAS-FITTER.

WANTED, a good Workman in Iron and Compo. Pipe, who can Lay Mains and Services, is capable of doing Smithing, and also understands the routine of a Gas-Works. To a steady man the situation would be a permanent one.
Apply, with testimonials, stating wages required, to T. W. R. WHITE, Gas-Works, SHERBORNE.

WANTED immediately, for a Gas and Water Works, a good FITTER, competent to Lay Mains and Services in iron and lead pipe. Fix Meters, and capable of making Plumber's Wiped Joints. Preference will be given to one having a knowledge of the general routine of a Gas-Works. Wages 23s. per week.
Apply by letter only, with references, to Mr. F. RUSSELL, 40, Fore Street, ILFRACOMBE.

TAR.—Wanted, to Purchase a few thou- sand gallons. State price filled into casks on Works, or delivered on rail.
Address No. 664, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

FOR SALE—A Second-hand Square STATION-METER, to pass 40,000 cubic feet per hour. Erected about 12 years. Made by Messrs. J. and J. Braddock, Oldham. Now in use at the Plymouth Gas-Works. To be removed to make place for a larger sized Meter. To be sold a bargain.
For price and particulars apply to W. W. ANDREWS, 238, Kingsland Road, LONDON.

A BARGAIN.

FOR IMMEDIATE SALE—A Round STATION-METER, capable of passing 2500 cubic feet per hour (clock in centre), three 4-in. Bends, and one 5-in. Four-way Valve, which have been taken down to make room for a larger one.
Apply to Mr. W. C. DAWSON, Gas-Works, ARUNDEL.

EXHAUSTER FOR SALE.

THE Malton Gas Company have for Disposal an EXHAUSTER and ENGINE, erected by Messrs. Dempster in 1873, capable of passing 7000 cubic feet per hour.
It may be seen in operation, and further particulars obtained on application to the undersigned.
HENRY TOBEY, Secretary.

THE Gloucester Gas Company, ceasing to manufacture gas at their old works, will have the undermentioned APPARATUS for Sale about the beginning of August, viz.:—
About 150 feet of D-shape Wrought-Iron Hydraulic Main, size 19 in. by 19 in. Also about 38 ft. of D-shaped Wrought-Iron Hydraulic Main, size 20 in. by 20 in. Annular Condenser, consisting of six Vertical Pipes, 24 in. diameter, 19 ft. high, with three 12-in. Slide-Valves and 12-in. Connections.
Scrubber (round), 5 ft. by 20 ft., with three 12-in. Slide-Valves, and 12-in. Connections.
Exhauster (Jones) to pass about 15,000 feet per hour.
Exhauster (Beales) to pass about 25,000 feet per hour.
Two Vertical Steam-Engines, each about 6-horse power, with Pulleys, and Shafting used for driving the above.
Boiler 14 ft. 6 in. by 3 ft. 6 in., with Centre Tube, and four Galloway Patent Tubes.
4-horse power Horizontal Steam-Engine.
Three 4-in. Pumps, with cranked Shafting and a pair of Mitre Wheels.
Two Purifiers, 16 ft. by 8 ft., with six 12-in. Slide-Valves and 12-in. Connections.
Gasholder, Double Lift, with Cast-Iron Tank, capacity 37,000 feet.
Gasholder, Double Lift, capacity 100,000 feet.
Gasholder, Double Lift, capacity 240,000 feet.
One 12-in. Governor, by Wright, London, with 12-in. Valves, Bye-Pass, and Connections.
Two 12-in. four-way faced Valves, by Cockey.
For further information, &c., apply to the undersigned.
R. MORLAND, Engineer.

CAMBRIDGE UNIVERSITY AND TOWN GASLIGHT COMPANY.

TO MANUFACTURING CHEMISTS AND OTHERS.

THE Directors of the above-named Com- pany have for Sale about 190 tons of Spent OXIDE OF IRON.
The same may be seen and samples taken upon application to
JAMES WEEKS, Manager.
Gas-Works, Cambridge, May 21, 1880.

CAMBRIDGE UNIVERSITY AND TOWN GASLIGHT COMPANY.

THE Directors of this Company have for Sale the undermentioned PLANT:—
18 Lengths of Hydraulic Main, each 9 ft. long, 18 in. by 15 in. diameter.
Three Lengths of Hydraulic Main, each 10 ft. long, 19 in. by 17 in. diameter.
126 Mouthpieces, with Ascension-Pipes, complete.
One Condenser, formed of 32 9-in. Pipes.
One Scrubber, 20 ft. high, 5 ft. diameter.
One Purifier, 11 ft. 6 in. square.
One ,, 14 ft. ,,
One Travelling Crane for the above.
One Meter to pass 15,000 cubic feet per hour.
One Governor to pass 30,000 ,, ,,
Two 9-in. and eight 12-in. Valves.
Four Wrought Girders, each 44 ft. long by 17 in. by 6½ in.
Two Cast Columns, each 21 ft. long by 13 in. by 10 in.
Two ,, ,, 14 ,, 10 ,, 8 ,,
Two ,, ,, 11 ,, 9 ,, 7 ,,
One ,, ,, 10 ,, 12 ,, 10 ,,
The above may be seen and further particulars obtained of
JAMES WEEKS, Manager.
Gas-Works, Cambridge, May 21, 1880.

GAS PLANT FOR SALE.

THE Coventry Gas Company have for SALE—
SCRUBBERS.—One 5 ft. 6 in. diameter, 15 ft. high. One 5 ft. diameter, 20 ft. high; with or without 8-in. Connections and Valves.
STEAM-JET VENTILATOR.—One No. 2 Körting's Patent Jet Ventilator, with Chest. One No. 3½ Körting's Patent Jet Blower.
VALVE.—One 12-in. Cathels's Four-way Valve.
The above are being replaced by larger apparatus, and can be removed at once. Also a 100-light Gas Apparatus (Porter's make); this includes a Gasholder, 14 ft. diameter and 10 ft. high, which could be sold separately.
For particulars and prices apply to
W. L. ROBINSON, Manager.
Gas-Works, Coventry, April 17, 1880.

THE Sheffield United Gaslight Company OFFER for SALE the following lots of Retort-House FITTINGS, which they are now taking down at two of their Stations:—
54 Pieces Cast-Iron Hydraulic Main, U-shaped, 9 ft. 6 in. by 18 in. by 18 in.
16 Pieces Cast-Iron Hydraulic Main, U-shaped, 9 ft. 6 in. by 18 in. by 15 in.
4 Pieces Cast-Iron Hydraulic Main, U-shaped, 9 ft. 6 in. by 16 in. by 15 in.
320 Cast-Iron Mouthpieces, D-shaped, 21 in. by 15 in.
160 Lengths 4-in. Cast-Iron Ascension-Pipes, straight, 7 ft. 6 in. long.
215 Lengths 4-in. Cast-Iron Ascension-Pipes, straight, 5 ft. 6 in. long.
50 Lengths 4-in. Cast-Iron Ascension-Pipes, curved, 5 ft. 6 in. long.
60 Lengths 4-in. Cast-Iron Ascension-Pipes, curved, 2 ft. 8 in.
37 Lengths 4-in. Cast-Iron Ascension-Pipes, curved, 10 ft. 2 in.
40 Lengths 4-in. Cast-Iron Ascension-Pipes, straight, 5 ft. 10 in.
17 Lengths 4-in. Cast-Iron Ascension-Pipes, straight, 5 ft. 5 in.
481 Lengths 4-in. Cast-Iron H-Pipes.
506 Lengths 4-in. Cast-Iron Dip-Pipes.
The above apparatus has been in use up to a recent date, and is adapted for re-erection.
The Company will be prepared to receive an offer for the whole or any portion of the above. Price £4 per ton, loaded into trucks at Sheffield.
Applications to be addressed to the undersigned.
THOS. ROBERTS, Manager.
Gas Office, Sheffield, March 25, 1880.

GAS PLANT FOR SALE.

THE Maidstone Gas Company having enlarged their Works, offer the following Apparatus for Sale in good condition:—
SCRUBBERS.—One Tower Scrubber 30 ft. high by 10 ft. diameter, with Distributor, and partly fitted with Livesey's boards.
CONDENSERS.—One Set of Annular Condensers, consisting of 9 Pipes 17 ft. high, outer diameter 2 ft. 6 in., fitted with 12-in. Valves complete.
ENGINES.—Two 12-Horse Power Horizontal Engines in very good condition.
STATION-METER.—By Milne and Son, in first-class condition, ornamental case, with Valves and Bye-pass complete; to pass 20,000 cubic feet per hour.
HYDRAULIC MAIN.—Six 8 ft. by 18 in. Hydraulic Main D wrought iron; 24 8 ft. 9 in. by 18 in. Hydraulic Main D wrought iron. Nearly new.
BRIDGE AND ASCENSION PIPES.—90 6 in. by 4 in. Bridge-Pipes, and a quantity of 6-in. Ascension-Pipes and Bends.
RETORTS.—31 Rounds, 15 in. diameter and 9½ ft. long, in two pieces. 2 Ovals, 21 in. by 15 in. and 9 ft. long, in one piece. All of Stourbridge Fire-Clay, and in good condition.
For further particulars and price apply to
JOHN WEST, Engineer and Manager.
Gas Works, Maidstone, April 21, 1880.

TO TAR DISTILLERS AND OTHERS.

THE Directors of the Coventry Gas Com- pany are ready to receive TENDERS for the Purchase of the Surplus TAR produced at their Works.
Tenders to state price per ton of 20 cwt. delivered into boats at Coventry for One, Two, or Three years from July 1, 1880. Weight to be taken over the Gas Companies weigh-bridge at the Gas-Works.
Present annual quantity, 800 tons.
Tenders to be delivered not later than the 14th of June, addressed to the CHAIRMAN.

TO GASHOLDER MAKERS.

THE Directors of the Kirkham (Lan- cashire) Gas Company are prepared to receive TENDERS for the Erection of a GASHOLDER, 50 ft. diameter by 18 ft. deep.
Plans and specifications may be seen on application to Mr. Green, Gas Engineer, Preston.
Sealed tenders, addressed to the Chairman of the Company, and endorsed "Tender for Gasholder," must be delivered on or before Monday, the 21st of June next.
The Directors do not bind themselves to accept the lowest or any tender.
BENJAMIN STUTTARD, Secretary.

EXETER GASLIGHT AND COKE COMPANY.

THE Directors of the Exeter Gaslight and Coke Company are prepared to receive TENDERS for the Replating, &c., of a Double GASHOLDER at their Works.
Particulars may be obtained on application to the Engineer, at the Basin gas-works and sealed tenders, endorsed "Tender for Repairs to Gasholder," to be sent to me, the undersigned, on or before Monday, June 14.
The Directors do not bind themselves to accept the lowest or any tender, nor will they pay for estimates.
By order,
W. A. PADFIELD, Secretary.
Gas Offices, Exeter, May 20, 1880.

CITY OF CARLISLE.

TENDERS FOR COAL AND CANNEL.

THE Carlisle Gas Committee are pre- pared to receive TENDERS for the Supply of about 10,000 Tons of Screened or Unscreened GAS COAL, and about 2000 Tons of CANNEL, to be delivered in Carlisle in such quantities as may be directed, from July, 1880, to June, 1881.
Tenders, specifying the description of the Coal or Cannel, the pits at which they are raised, and the terms for net monthly payment, are to be sent to me on or before June 2, 1880, endorsed "Tender for Coal."
J. HEPWORTH, Engineer and Manager.
Gas-Works, Carlisle, May 20, 1880.

BOROUGH OF NEATH, GLAMORGANSHIRE.

THE Town Council of this Borough are prepared to receive APPLICATIONS for the Managership of the Corporation Gas-Works in this Borough. The Manager will be required to discharge all the duties incident to the management and conduct of the Gas-Works, and the keeping of the accounts thereof (with the assistance of one person to act as Clerk and Collector), and to devote the whole of his time to the discharge of such duties in connection with the Works as shall be directed by the Corporation or its Gas Committee. Salary £200 per annum, payable quarterly, with an allowance of coal and gas for private consumption at own residence.
Applications and testimonials (such applications to state when the applicant would be at liberty to enter upon the duties of his office) to be sent, addressed to the Town Council, and endorsed "Application for Gas-Works Managership," under cover to me, on or before the 12th of June, 1880.
By order,
ALFRED CURTIS, Town Clerk.
Neath, May 24, 1880.

THE SHREWSBURY GASLIGHT COMPANY.

AMMONIACAL LIQUOR.

THE Directors of the above Company are desirous of receiving TENDERS for the Purchase of the Surplus AMMONIACAL LIQUOR made at their Works during the Three years commencing July 1, 1880.
The estimated quantity for disposal is about 1200 tons per annum, delivered into tanks on the London and North-Western Railway, or into boats on S.U. Canal (the latter preferred) at Shrewsbury.
Payments to be made monthly, net.
Tenders to state a separate price per Ton for Liquor of 5°, 6°, and 7° Twaddel, and to be sent in to the undersigned not later than June 7, 1880.
The Directors do not bind themselves to accept the highest or any tender.
By order,
WM. BELTON, Secretary and Manager.
Gas-Works, Shrewsbury, May 10, 1880.

MANCHESTER CORPORATION GAS-WORKS.

TO TAR DISTILLERS AND OTHERS.

THE Gas Committee are prepared to receive TENDERS for the Purchase of the whole or a portion of the GAS TAR to be produced at their Gaythorn and Rochdale Road Works during a period of Three or more years, commencing on the 1st day of March, 1881.
Sealed tenders, addressed to the Chairman of the Gas Committee, Town Hall, Manchester, and endorsed "Tender for Gas Tar," must be delivered here on or before Wednesday, the 16th day of June next.
The Committee do not bind themselves to accept the highest or any tender.
Further particulars and forms of tender may be obtained on application to Mr. Geo. B. Jackson, at the Gas Office.
By order,
JOS. HERON, Town Clerk.
Town Hall, Manchester, May 15, 1880.

SALFORD CORPORATION GAS-WORKS.

THE Corporation of Salford invite TENDERS for the Supply of CANNEL and COAL required at the various Gas Stations in Salford for One, Two, Three, or more years, commencing on 1st September next.
Forms of tender (upon which only tenders will be received) and all particulars may be obtained on application to the Engineer, Mr. Samuel Hunter, Gas-Works, Lamb Lane, Salford.
Tenders, endorsed "Cannel and Coal Contract," to be delivered to me on or before the 22nd of June next.
The Corporation do not bind themselves to accept the lowest or any tender.
By order,
CHRIS. MOORHOUSE, Town Clerk.
Town Hall, Salford, May 14, 1880.

BRITISH
ASSOCIATION OF GAS MANAGERS.

ANNUAL MEETING OF MEMBERS.

PROGRAMME OF ARRANGEMENTS.

THE SEVENTEENTH
ANNUAL GENERAL MEETING

OF THE MEMBERS OF THIS ASSOCIATION WILL BE HELD ON

TUESDAY, WEDNESDAY, & THURSDAY, JUNE 8, 9, & 10, 1880,

AT THE

INSTITUTION OF CIVIL ENGINEERS,

25, GREAT GEORGE STREET, WESTMINSTER.

CHARLES HUNT, ESQ., C.E., VICE-PRESIDENT,

Will occupy the Chair.

ORDER OF PROCEEDINGS.

TUESDAY, JUNE 8, 1880.—Morning Meeting.

The Chair to be taken at Ten o'clock.

Inaugural Address by the Acting President. | Admission of New Members.
Reading of Papers and Communications.

Evening Meeting.

The Chair will be taken at Half-past Seven o'clock.

A Lecture will be delivered by GREVILLE WILLIAMS, Esq., F.R.S., on "The Past, Present, and Future of Coal Tar."

WEDNESDAY, JUNE 9, 1880.

The Chair to be taken at Ten o'clock.

Reading of Papers and Communications, Amendment of Rules, and the Transaction of other Business, Election of Officers for the ensuing Year, &c.

At Six o'clock p.m. the Members and Friends will dine together at the Cannon Street Hotel.

Tickets for the Dinner, 7s. 6d. each, may be had from the Secretary, if taken on or before the 8th of June. After that date 10s. will be charged.

THURSDAY, JUNE 10, 1880.

An Excursion by Steamboat to Beckton, where, by the courtesy of the Chartered Gas Company, the Members will have the opportunity of inspecting not only the vast extensions made since their last visit, but the very interesting Residual Products Manufacture Works, which have now been in operation some time. On concluding the inspection, the Members will re-embark, after which Luncheon will be served. Arrangements will be made for the Boat to return to London between 6 and 7 o'clock.

LIST OF PAPERS AND COMMUNICATIONS

TO BE SUBMITTED TO THE MEETING.

The Order in which the Papers are to be Read will be determined by the Committee prior to the Meeting, so as to suit the general convenience.

1. "Some Experiments on the Thermal Power of Gas Cooking and Heating Apparatus." By T. TRAVERS, of Cork.
2. "Regenerating Furnaces, as applied to the Heating of Retorts." By G. E. STEVENSON, of Peterborough.
3. "Retort Furnaces." By F. LIVESEY, of London.
4. "Concrete Tanks." By W. ROMANS, of Sheffield.
5. "Gasholder Tanks: Defects in Construction." By GEORGE LIVESEY, of London.
6. "Testing Gas Coals." By HARRISON VERVERS, of Dukinfield.
7. "Statistics of Working Results." By G. E. STEVENSON, of Peterborough.
8. "Standards for the Estimation of Illuminating Power." By F. W. HARTLEY, of London.
9. "The Chemistry of Spent Lime." By WM. FOSTER, of London.
10. "The Construction of Gasholders." By G. BAKER, of Birmingham.
11. "An Apparatus for Preventing the Oscillation caused by the Exhauster, and for the Removal of Tar." By J. SOMERVILLE, of London.
12. "Some Fallacies regarding Gas-Burners, with Remarks on Street Lighting." By GEO. BRAY, of Leeds.

May 24, 1880. WILLIAM H. BENNETT, *Secretary.*

THE
THAMES BANK IRON COMPANY,
UPPER GROUND STREET, LONDON, S.E.,
SUPPLY FROM STOCK
CAST-IRON RETORTS AND ALL KINDS OF GAS-WORKS APPARATUS,
SOCKET-PIPES FOR GAS OR WATER PURPOSES,
FLANGE-PIPES FOR STEAM,
RAIN-WATER PIPES AND GUTTERS,
HOT-WATER BOILERS, PIPES, AND CONNECTIONS,
LAMP-COLUMNS, LAMPS, LAMP-FRAMES, WROUGHT TUBES, &c.,
HOT WATER AND HOT AIR APPARATUS,
Erected complete on the most Improved Principles.

BIRMINGHAM CORPORATION GAS-WORKS.

AMMONIACAL LIQUOR.

THE Gas Committee of the Corporation of Birmingham are prepared to receive TENDERS for the Purchase of AMMONIACAL LIQUOR produced at their Windsor Street Works during a period of Seven years, from September, 1881.

The present Ammoniacal production is 2,600,000 gallons.

Forms of tender may be obtained on application to

EDWIN SMITH, Secretary.

Offices of the Department, Old Square, Birmingham.

SECOND-HAND ENGINES, EXHAUSTERS, BOILERS, &c.

THE Scarborough Gas Company invite OFFERS for the Purchase of their present Duplicate Exhausting Machinery, comprising Two 7-in. Cylinder by 14-in. Stroke Horizontal Steam-Engines; Two 20,000 cubic feet per hour Gwynne and Beale's Patent Exhausters; Two Hydraulic Governors in Connection with Throttle Valves of Engines; and Two Cornish Boilers, 11 ft. by 3 ft. 9 in.

The whole are of superior make and have been carefully used, and are well worth attention, being about to be removed for replacement by larger and more powerful apparatus.

The machinery may be seen in operation until the 30th of April, and further particulars may be obtained on application to the undersigned.

By order,
WILLIAM J. MOON, Manager.

Scarborough, March 5, 1880.

BOROUGH OF BIRKENHEAD.

TO IRONFOUNDERS.

THE Corporation of Birkenhead invite TENDERS for the supply of Cast-Iron PIPES of different sizes from 2 in. to 24 in. internal diameter, to meet their requirements during the Twelve months ending June 30, 1881.

Form of tender and copy of specification may be obtained upon application at the Gas and Water Offices.

Tenders, endorsed "Tender for Pipes," and addressed to the Chairman of the Gas and Water Committee, Municipal Offices, Hamilton Square, Birkenhead, to be sent in not later than Friday, the 18th prox.

The Corporation do not bind themselves to accept the lowest or any tender.

By order,
AMBROSE WALN, Town Clerk.

Municipal Offices, Birkenhead, May 28, 1880.

THE Corporation of Birkenhead invite TENDERS for the Supply of best Screened GAS COAL and CANNEL, at the rate of 6300 Tons of Coal and 10,300 tons of Cannel per annum, for One, Two, or Three years from the 1st of July next, to be delivered at the Gas-Works, Thomas Street, Birkenhead, in weekly quantities to be agreed upon. Also TENDERS for the supply of STEAM COAL, delivered at their Water-Works, Claybrick Hill and Spring Hill; and for the supply of Slack for their Pumping Station, situate at the Borough Road, Tranmere, in quantities as may be ordered by their Engineer, during One, Two, or Three years from the 1st of July next.

Tenders, specifying the description of Coal, Cannel, or Slack, and endorsed "Tender for Coal, &c.," addressed to the Chairman of the Gas and Water Committee, Municipal Offices, Birkenhead, to be sent in not later than Friday, the 11th of June next.

The Coal, Cannel, and Slack will require to be carted from the railway to the Works, and weighed over the Corporation weighing machines at the rate of 20 cwt. to the ton.

The Corporation do not bind themselves to accept the lowest or any Tender, and they are to be at liberty to accept any less quantity at the rate quoted.

By order,
AMBROSE WALN, Town Clerk.

Municipal Offices, Birkenhead, May 28, 1880.

THE Corporation of Birkenhead invite TENDERS for the Supply of GAS TUBES in assorted lengths and fittings, delivered at the Railway Station, Birkenhead, in quantities as may be ordered by their Engineer until the 30th of June, 1881. Payments monthly.

Tenders, stating rate of discount from list price for Tubes and Fittings respectively, addressed to the Chairman of the Gas and Water Committee, No. 50, Hamilton square, Birkenhead, to be sent in not later than 5 o'clock p.m. on Friday, the 18th prox.

The Corporation do not bind themselves to accept the lowest or any tender.

By order,
AMBROSE WALN, Town Clerk.

Municipal Offices, Birkenhead, May 29, 1880.

MR. FREDK. COLYER, M. Inst. C.E., informs his clients and friends his Offices are now at 18, GREAT GEORGE ST., WESTMINSTER, S.W., where he may be consulted upon any matter relating to Gas or Water Works.

COVENTRY GAS COMPANY.

CORN EXCHANGE, COVENTRY.

THREE DAYS ONLY—JUNE 7, 8, & 9.

EXHIBITION OF GAS COOKING AND HEATING STOVES,

GAS-ENGINES, BURNERS,

And other Appliances and Inventions, showing the Advantages and Economical Use of Gas for Domestic and Manufacturing Purposes.

HOURS, 10 A.M. TILL 9.30 P.M.

Admission till 5 p.m., Sixpence: after 5 p.m., Threepence

Imperial METER COMPY.,

LIMITED,

Makers of THE IMPROVED DRY GAS-METERS, THE PATENT WET GAS-METERS, Special Meters for Public Lighting, STATION-METERS, Governors, &c.

KING'S ROAD, ST. PANCRAS.

Formerly also (**Walter Ford**) at Gray's Inn Road.

S. PONTIFEX & CO.,

GAS AND WATER ENGINEERS,

22, COLEMAN STREET, LONDON, E.C.,

Supply and Erect Street Lamp Columns, together with Head Irons and Lanterns, as well as all the other fitting connected therewith.

S. P. & Co. also contract with Gas, Railway, and other Companies, Local Boards, and Vestries, for the maintenance and repair of Lamps and Fittings.

ERECTION of CHEMICAL PLANT.

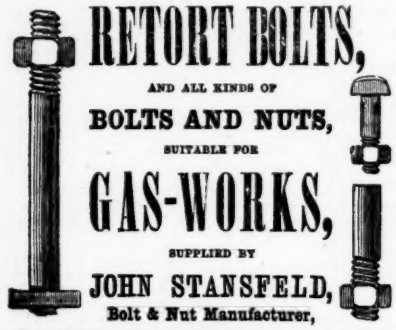
SPECIALITIES.

SULPHATE OF AMMONIA APPARATUS.
NON-CONTINUOUS AND CONTINUOUS PROCESSES FOR SMALL OR LARGE WORKS.

Liquor Ammonia Apparatus which does away with first making Crude Liquor and then Finishing. The Crude and Rectifying by my plan is worked at the *same* time throughout, in the same plant, with better results, and in half the time.

Assistance given in Erecting and Working Tar or Ammonia Works, either personally or by letter. Terms moderate.

Models of above plant, prices £2 2s., £3 3s., £2 10s. delivered.
JOHN G. HARVEY, 84, COBOURG STREET, LEEDS.



RETORT BOLTS,

AND ALL KINDS OF

BOLTS AND NUTS,

SUITABLE FOR

GAS-WORKS,

SUPPLIED BY

JOHN STANSFELD,

Bolt & Nut Manufacturer,

ALFRED ST., BOAR LANE, LEEDS.

GEORGE E. TOURNAY,

CONTRACTOR FOR THE ERECTION AND REBUILDING OF RETORT-BENCHES, CHIMNEY SHAFTS, &c.

RETORT SETTING A SPÉCIALITÉ.
References to large and small Works.
ADDRESS: WINCHEAP, CANTERBURY.

W. C. HOLMES & Co.,

ENGINEERS AND CONTRACTORS

FOR

GAS AND WATER-WORKS,

WHITESTONE IRON-WORKS,

HUDDERSFIELD.

REFERENCES TO UPWARDS OF 400 WORKS.

CAN THE HYDRAULIC MAIN BE ABOLISHED?

YES, very easily, by using

WHITE'S AUTOMATIC GAS-VALVE.

HERE'S PROOF:—

Gas-Works, Aberystwith, Jan. 24, 1880.

Mr. Wm. White, Abersychan, Mon.

Dear Sir,—The retorts fitted with your Valves answer very well. Our average make is 5600 cubic feet per mouthpiece, and we have no difficulty in producing 16-CANDLE GAS WITHOUT ANY CANNEL; although we formerly (with the old hydraulic dip-pipes) used a percentage to obtain that candle power. During the whole time they have been at work we have not been troubled with a choked ascension-pipe.

Yours respectfully,
J. DOUGALL, Engineer.

Mold Gas and Water Company's Works, Mold, May 28, 1880.

Mr. W. White, Gas Engineer, Abersychan.

Dear Sir,—After two years experience of your "Patent Automatic Gas Valve," which I consider a fair trial, I come to the following conclusions:—

1. That they are perfectly reliable as a complete seal.
2. An almost utter absence of back pressure.
3. Great freedom from deposit of carbon, some retorts not having been scurfed since adoption of valves.
4. They require no attention whatever, as we have not touched them since putting up.
5. The economy of your system is so great, and the evils it removes so many, that I would not return to the antiquated "dip" upon any consideration, and strongly recommend your method to the gas world.

Yours respectfully,
E. OWEN, Engineer.

NOTE.—Other testimony to follow. Illustrated pamphlet descriptive of the system sent post free for 6½d. in stamps, on application to the Inventor and Patentee as above.

OXIDE OF IRON.

Gas Companies can be supplied with any quantity of Natural Oxide suitable for Gas Purification purposes. Shipped direct from the extensive estates in Co. Donegal of the Earl of Leitrim and Wybrants Olphert, Esq., D.L.

By thus purchasing from the producer a constant supply of the purest material will be ensured to the Gas-Works, and intermediate profits will be saved to the Shareholders.

For terms, references, and particulars apply to
JOHN BEATTIE,
FALCARAGH, CO. DONEGAL, IRELAND.

THOMAS PROUD,

BROOKFIELD WORKS,

103, ICKNIELD ST., BIRMINGHAM,

MANUFACTURER OF

WOOD GRIDS

FOR

PURIFIERS AND SCRUBBERS,

AND

GENERAL STEEL AND IRON TOOLS AND MATERIAL USED IN GAS-WORKS.

E. & W. H. HALEY,

IRONFOUNDERS & MAKERS OF

CAST-IRON PIPES

FOR

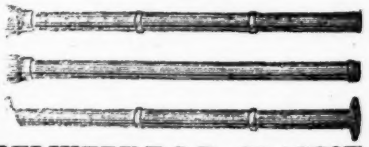
GAS, WATER, & STEAM.

LISTER HILLS FOUNDRY,
BRADFORD, YORKSHIRE.

GAS AND WATER PIPES.

WILLIAM MACLEOD & CO.,
170, ST. ENOCH SQUARE, GLASGOW.

CAST-IRON GAS AND WATER PIPES.

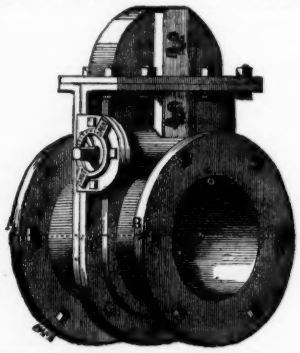


DELIVERY F.O.B., GLASGOW.
Prices on application.

B. DONKIN & CO.'S

IMPROVED GAS-VALVES

WITH WROUGHT-IRON PINIONS.



These Valves are proved on both sides to 30 lbs. on the square inch before leaving the works, and are kept in stock.
In ordering Valves, please state whether required for under or above ground, and if to be with flanges or spigots and sockets cast on, or with separate spigot and socket pieces.

ALSO MAKERS OF

J. BEALE'S NEW PATENT GAS EXHAUSTERS, STEAM-ENGINES for Driving Gas Exhausters,
VALVES FOR AMMONIACAL LIQUOR, TAR, &c., IMPROVED BRIDGE VALVES for Regulating the Seal in Hydraulic Mains, so arranged that when once adjusted for the proper overflow they can be closed entirely and opened again without altering the adjustment.
GAS THROTTLE-VALVES, SPECIAL GAS-VALVES with Columns, Gauges, &c.
BYE-PASS VALVES, SCREW WATER-VALVES, &c., &c.

B. DONKIN & CO., BERMONDSEY, LONDON, S.E.

SAMUEL CUTLER & SONS,

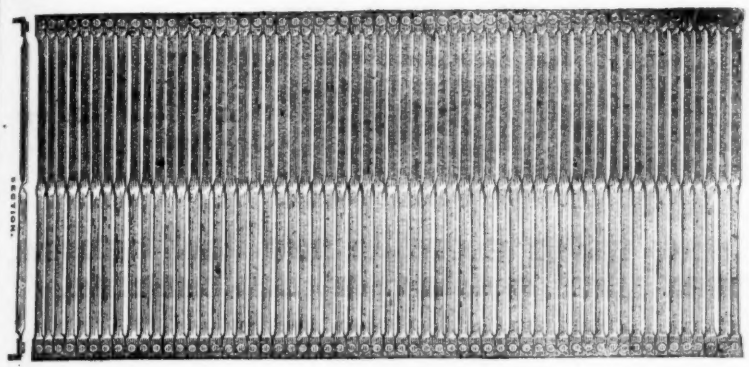
MILLWALL, LONDON, E.,

CONTRACTORS FOR THE

ERECTION OF GAS AND WATER WORKS,

Undertake their ENTIRE ERECTION or EXTENSION in any part of the World, including Small Works for VILLAGES and MANSIONS, as well as of very LARGE EXTENT. Have recently constructed for the PHŒNIX GAS COMPANY the LARGEST GASHOLDER yet erected.

S. C. and SONS supply *every* requisite for Gas-Works, and keep in stock Small Articles, such as BARROWS, SCOOPS, RETORT-LIDS, BOLTS, &c.; and they manufacture WOOD SIEVES of a very superior description.



CUTLER'S PATENT WATER-VALVES

Are the very best possible as PURIFIER VALVES; leakage impossible, most easy to work, never get out of order or the worse for wear, and can, if desired, be very simply arranged to work the whole or a part of a set of Purifiers in any conceivable order whatever. Have already been erected and approved at the London Gas-Works, Nine Elms; Phœnix Gas-Works, Greenwich; Maidstone, Ipswich, &c.

Full Particulars on Application.

CUTLER'S PATENT SIEVES

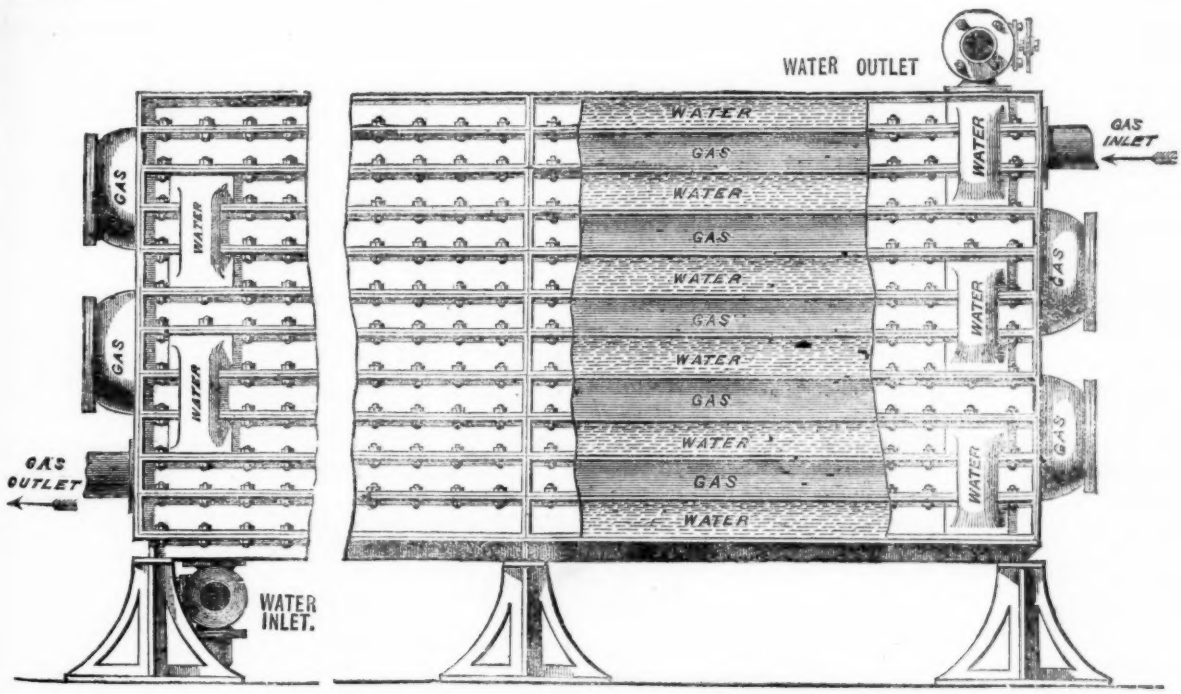
Are the most durable. The sieve bars presenting an inclined plane to the flow of the Gas, offer the least possible resistance, greatly reducing pressure, and permitting contact with every part of the purifying material. Have been supplied to many of the London and Provincial Gas-Works, and give great satisfaction.

Copies of Testimonials on Application.

MORRIS AND CUTLER'S PATENT CONDENSERS

Adopt water as a cooling medium, the respective streams flowing in opposite directions; quantity of water required but small, and being only raised in temperature, is useful for any purpose of the works. The power of Condensers can be regulated at will by the amount of water permitted to pass through. Erected and giving great satisfaction at Brentford, Tunbridge Wells, Maidstone, Buxton, Phœnix Gas-Works, Greenwich; where its advantages may be seen.

Mr. WATES, of Greenwich, has kindly offered to reply to any inquiries addressed to him as to its efficiency.



Also CUTLER'S PATENT MOUTHPIECE SUPPORTS,

AND

CUTLER'S PATENT REMOVABLE DIPS.

[*See* JOURNAL for Nov. 25, 1879.]

WILLIAM SUGG'S IMPROVED SYSTEM OF STREET LIGHTING,

By means of his large Argand Burners and Shadowless Lanterns of 50 to 400 Candles Illuminating Power for Common and Cannel Gas.

The fact that over 1200 of the large Argand Burners and Lanterns have been supplied to Municipal Authorities and Gas Companies in England alone, within a very short time, speaks of the excellence of this system and the real merits it has been proved to possess.

The Burners and Lanterns are in use by the following:—

The Gaslight and Coke Company.
South Metropolitan (including Phœnix) Gas Company.
London Gas Company.
Commercial Gas Company.
Lambeth Vestry.
St. George's Vestry.
St. Mary's (Rotherhithe) Vestry.
Lewisham Board of Works.
St. Giles's Board of Works.
Whitechapel Board of Works.
Great Eastern Railway.
Great Northern Railway.
London, Brighton, and South Coast Railway (Victoria and London Bridge Stations).
Metropolitan Railway.
Columbia Market, London.

UPWARDS OF EIGHTY ARE NOW BEING FIXED AT THE NEW CENTRAL STATION OF THE CHESHIRE LINES COMMITTEE, MANCHESTER.

They are also in use at the following, amongst other places:—

Peterborough.	Chesterfield.	Ramsgate.	Sheffield.	Greenock.
Scarborough.	Nottingham.	Blackburn.	Oldham.	Glasgow.
Eastbourne.	Leicester.	Liverpool.	Hastings.	Leith.
Durham.	Stoke-upon-Trent.	Doncaster.	Sunderland.	Paisley.
Weymouth.	Hull.	Richmond.	Rochdale.	Perth.
South Shields.	Brighton.	Colchester.	Great Grimsby.	Nelson.
Swansea.	Cardiff.	West Hartlepool.	Southampton.	Dundalk.
Wakefield.	Mirfield.	Portsea.	Preston.	Cork.
Wigan.	Reading.	Salford.	Manchester.	Belfast.
Birmingham.	Jersey.	Lincoln.	Bradford.	Dublin.
Barnstaple.	Bournemouth.	Lancaster.	Dewsbury.	Newry.
Newport, Mon.	Newbury, Berks.	Frome.	Whitehaven.	Ballymena.
Boston.	Devonport.	Epsom.	Canterbury.	Limerick.
Croydon.	Buxton.	Newtown.	Harrogate.	Longton.
Runcorn.	Warwick.	Douglas.	Eton.	Blackpool.
Swindon.	Accrington.	Rotherham.	Keighley.	Winchester.
Louth.	Newcastle.	Shrewsbury.	Retford.	Stafford.
Norwich.	Charlton.	Bolton.	Carlisle.	&c., &c.
Reigate.	Risca.	Pontymister.	Roydon.	

And at the following places abroad:—

St. Petersburg.	Elberfeld.	Cologne.	St. John's, Newfoundland.	San Paolo.
Moscow.	Emerich.	The Hague.	Quebec.	Buenos Ayres
Madrid.	Carlsruhe.	Amsterdam.	Ontario.	Monte Video.
Frankfort.	Haarlem.	Rotterdam.	Ottawa.	Hong Kong.
Berlin.	Utrecht.	Odensee.	Milwaukee.	Singapore.
Vienna.	Stockholm.	Schaffhausen.	New York.	Philadelphia.
Toulouse.	Christiania.	Bombay.	Sydney.	San Francisco.
Zurich.	Brussels.	Calcutta.	Melbourne.	Rio de Janeiro.
Munich.	Stettin.	Christchurch, New Zealand.	Port Adelaide.	Shanghai.
Leipsic.	Geneva.	St. Thomas, West Indies.	Cape Town.	&c., &c.
Crefeld.	Cagliari.		Bendigo.	
Kœnigsberg.	Interlaken.			

Prices and particulars on application to

WILLIAM SUGG,

ENGINEER,

VINCENT WORKS, VINCENT STREET, WESTMINSTER.

HONOURABLE MENTION.

PARIS EXHIBITION, 1878.

J. E. WILLIAMS & CO.,

SOLE MANUFACTURERS OF THE

SPECIAL METALLIC OXIDE PAINT,

Largely used by Gas Companies, Corporations, Railway Companies, Ironfounders, and Machinists.

HONOURABLE MENTION.

PARIS EXHIBITION, 1878.

It has the following qualifications and properties:—

Effectually prevents and arrests corrosion.
Has a fine gloss, and is very durable.
Does not require driers like other paints.
Protects iron from action of water.

Is not affected by sulphuretted hydrogen.
Forms a very hard, tough (not brittle) surface.
Will not crack, blister, or scale.
Is not affected by extremes of temperature.

Covers nearly double the area of other paints. (7 gallons or 1 cwt. will cover 1211 square yards of ironwork.)
Is cheaper and more economical than any other.

VICTORIA PAINT WORKS, COLLYHURST, MANCHESTER.

ECONOMY IN THE PRODUCTION OF GAS.

PLUTONIC CEMENT,

FOR JOINTING AND REPAIRING RETORTS AND OVENS *in* ACTION AND *out* OF ACTION.

Pamphlet on the advantages of the above, with Modes of Application, References, Prices, &c., free by post, from the Sole Manufacturer,

WILLIAM RICHARDSON, Gas and Hydraulic Engineer, CHARLES HENRY STREET, and BISSELL STREET, BIRMINGHAM.

PORTBURY, PATERSON, & CO.,

WET AND DRY GAS-METER MANUFACTURERS.

STATION-METERS, PRESSURE-GAUGES, &c., of the Highest Excellence only.

VICTORIA METER-WORKS, EXETER.

COMPTOIR GÉNÉRAL D'USINES À GAZ ET CONDUITES D'EAUX.

Offices: 55, RUE CONDORCET, PARIS.

The Comptoir Général of Gas and Water Works is authorized by a leading Company to **Buy Gas and Water Works and Concessions.**

The Comptoir Général is established for the **Buying and Selling of Works and Concessions.**

The Comptoir Général guarantees Capital for *bonâ fide* Undertakings.

The Comptoir Général undertakes the **Formation of Companies in France.**

The Comptoir Général undertakes the **Formation of Companies in England.**

M. L. MOSER DULFUS, the Proprietor of the **Comptoir Général,** has had Twenty years experience in financial affairs, and has a large and influential connection in England, France, and on the Continent.

No Commission or Expenses whatever are charged unless success is secured.

Le Directeur-Gérant,

55, Rue Condorcet, Paris. BN. L. MOSER DULFUS.

THE PORTER-CLARK PROCESS

FOR THE

SOFTENING AND FILTRATION OF WATER IN LARGE QUANTITIES, WITHIN SMALL SPACE, AT SMALL COST.

(*See* JOURNAL *of Jan.* 6, 1880.)

In an article upon the Swindon Water Supply, the *Wilts and Gloucestershire Standard* of Aug. 9, 1879, says:—

"All praise is due to the Company who have thus provided a water supply that, if it can be equalled, we are safe in saying cannot be surpassed. . . . For the information of all caterers for public health, we explain that the mode of so effectually Purifying and softening the really good and naturally wholesome water is the 'PORTER-CLARK PROCESS.' 'CLARK'S PROCESS' was known to be chemically admirable; the improvements, however, effected by Mr. Porter, mechanically, are curious as they are perfect."

The filtration is exquisite, and everything arrested is removed daily.

The Visiting Justices of the Kent County Asylum at Chartham on Aug. 29, 1879—

Resolved, "That a favourable testimonial be given to Mr. Porter for his system down to the present time, and that the Clerk forward a copy of this resolution to Mr. Porter." (50,000 gallons daily.)

The Visiting Justices of the Middlesex County Asylum, Banstead Downs, under date of Sept. 12, 1879—

Certify, "That up to the present time the 'PORTER-CLARK WATER-SOFTENING PROCESS,' which has been in operation at this Asylum for about two years, has satisfactorily answered the purposes for which it was intended." (60,000 gallons daily.)

(See *The Times*, Aug. 23, 1877, Paper by Mr. F. J. Bramwell, F.R.S., Meeting of British Association, Plymouth.)

The Proprietor of the *Daily Chronicle* and *Lloyd's Weekly News* writes, Sept. 17, 1879—

"The 'PORTER-CLARK WATER-SOFTENING PROCESS,' erected by you at my paper-mill at Sittingbourne, continues to give satisfaction, and I no longer have any trouble with my steam-boilers. I am not yet working the filters up to their full capacity, only softening about 80,000 gallons per 24 hours, whereas I could easily do more than 120,000 gallons. I may add that it only requires one man to attend to the whole operation."

PATENTED BY JOHN HENDERSON PORTER, C.E.,

1 & 2, TUDOR STREET, BLACKFRIARS, LONDON, E.C.

BRAY'S
PATENT LANTERN AND FLAT-FLAME BURNERS.

80-CANDLE POWER LANTERN.

The understated declaration with which we introduced our apparatus has been fully borne out by general experience—namely, that

"THE FLAT-FLAME IS THE ONLY PRACTICABLE SYSTEM FOR STREET LIGHTING; and, 'in actual use,' yields as much light with Common Gas, and more with Cannel Gas, than any Argand System."

BIRMINGHAM LAMP TESTS

AFTER the most exhaustive series of experiments, extending over more than twelve months, with the most extensive assortment of Burners and Lanterns of large lighting power ever brought together, the Birmingham Authorities have

ADOPTED BRAY'S SYSTEM

for their Street-Lighting Improvements, for which purpose Sixty-Five 100-candle power Lanterns of medium lighting power are immediately required.

The apparatus used in the above tests were all of our usual medium lighting power class, and the tests showed that we sacrifice a considerable amount of lighting power for the sake of general efficiency. The tests further showed that our 80*-candle* HIGHEST *lighting power burner yielded* 3·51 *candles per foot of gas (the quality being* 16·75—3·35 *per foot—by the standard), which was a higher result than that yielded by any other flat-flame burner, and higher than the* 80*-candle power Argands.*

NOTE.—The above is the most conclusive answer to certain misleading statements which are being made by the most prominent of the defeated competitors.

Extract from the *Leeds Mercury*, April 1, 1880.

At the meeting of the Leeds Town Council, March 31, Alderman Gaunt moved that the Council approve of the acceptance by the Corporate Property Committee of the tender of Messrs. Geo. Bray and Co. for the supply of 21 new lamps, to be placed upon the pillars round the Town Hall. The Committee had tested Sugg's and other lamps, and found Messrs. Bray's the best. It was intended to have two 200-candles power and two 100-candles power, and 17 round the hall of 80-candles power. Mr. Lynd, in seconding the motion, said that he had had an opportunity of seeing different lamps tested at Birmingham, and he was in favour of Messrs. Bray's.

Extract from the *Daily Free Press*, Aberdeen, Jan. 1, 1880.

Judging of the merits of the lights as they appeared last night, on-lookers seemed to be generally of opinion that between Sugg's patent and Bray's larger light at the corner of Union Buildings, Castle Street, there was no perceptible difference in the illuminating power. When the vital question of gas consumption is taken into account, it is found that in the Castle Street lamps there is a marked difference in the quantity of gas consumed, for while 30 feet of gas are hourly burned in Sugg's Patent Lamp, only 20 feet are used by Bray's Lamp during the same period.

[The above Lamps have Meters attached.]

NOTE.—Mr. Sugg having freely advertised that among other places where his "burner and lantern have been adopted" is "Leeds," we have to state that, instead of having been adopted there, they have been discarded and returned to that gentleman months ago; nor is there one of his lanterns in the whole borough!

Bray's Lanterns have been adopted by the Vestry of St. George (which includes "WESTMINSTER"), Hanover Square, London, for all the crossings and refuges of that important district, after a direct competition with the Argand system of lighting; and also by about 40 Towns and Vestries, after a similar competition in most cases.

GEORGE BRAY & CO., BLACKMAN LANE, LEEDS.

F. & C. OSLER,

45, OXFORD STREET, LONDON, W.

MANUFACTORY AND SHOW-ROOMS:

BROAD STREET, BIRMINGHAM.

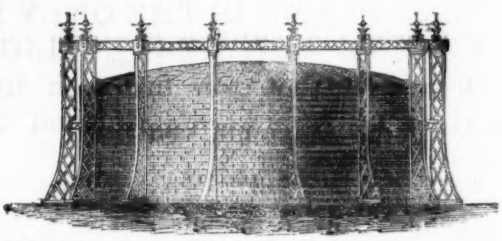
ESTABLISHED 1807.

MANUFACTURERS OF CRYSTAL GLASS CHANDELIERS,

WALL LIGHTS, AND LUSTRES FOR GAS AND CANDLES.

TABLE GLASS OF ALL KINDS.

CHANDELIERS IN BRONZE AND ORMOLU. MODERATOR LAMPS.



THE HORSELEY COMPANY,

LIMITED,

TIPTON, STAFFORDSHIRE.

LONDON OFFICE:

6, WESTMINSTER CHAMBERS, VICTORIA STREET,

GAS ENGINEERS, IRONFOUNDERS, &c.,

MANUFACTURERS OF

GASHOLDERS, WROUGHT AND CAST IRON TANKS, CONDENSERS, PURIFIERS, SCRUBBERS, MAINS, RETORT-LIDS, PLAIN AND DISHED, LAMP-POSTS, PIPES,

AND ALL REQUISITES FOR EITHER

GAS OR WATER WORKS;

ALSO

MAKERS OF ROOFS, BRIDGES, &c.

S. OWENS & CO.,

WHITEFRIARS STREET, LONDON, E.C.,

HYDRAULIC ENGINEERS,

AND MANUFACTURERS OF

PUMPING MACHINERY of every Description.

SOLE LICENSEES AND MANUFACTURERS FOR GREAT BRITAIN OF

BLAKE'S PATENT STEAM-PUMPS.

More than 10,000 in use,

ESPECIALLY ADAPTED FOR USE IN GAS AND CHEMICAL WORKS, FOR PUMPING TAR, WATER, AMMONIACAL LIQUOR, ACIDS, &c.

The following are some of the prominent advantages of the BLAKE PUMP:—

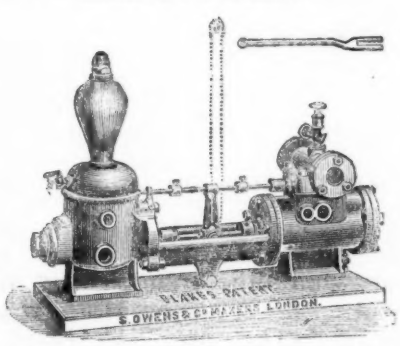
It will start at any point of stroke.

It has no dead point.

It works fast or slow, with the same certainty of action.

It is economical. Has a lead on the slide-valve.

It is compact and durable.



It is interchangeable in all its working parts.

It will deliver more water than any other pump.

It is made of best materials in the most workmanlike manner.

Can be worked at 20 strokes per hour, or 200 strokes per minute.

This Illustration represents Boiler-Feed Pumps, Sizes Nos. 1, 2, and 3, with Hand Lever for working Pump when Steam is not available.

SOLE MANUFACTURERS OF

MANN & OWENS
IMPROVED PATENT GAS-VALVES.

PRICED LISTS AND FULL PARTICULARS FURNISHED ON APPLICATION.

NOTICE TO MANAGERS OF GAS COMPANIES.

THE LAW UNION FIRE AND LIFE INSURANCE COMPANY, of No. 126, Chancery Lane, London, grants Policies of Insurance on Gas-Works, and Buildings connected therewith, which cover risk of explosion and spontaneous ignition of Coal, on very advantageous terms. Full particulars will be sent post free on application to

FRANK M'GEDY, Secretary.

126, Chancery Lane, London.

THOMAS CARR & SON,

MANUFACTURERS OF

FIRE-BRICKS, LUMPS, TILES, RETORTS, &c.,

SCOTSWOOD FIRE-BRICK WORKS, SCOTSWOOD-ON-TYNE.

Also Makers of all kinds of Common Building Bricks, and of Pressed White and Red Bricks for Facing.

JAMES OAKES & CO.,

ALFRETON IRON-WORKS, DERBYSHIRE,

AND

WENLOCK IRON WHARF, 21 & 22, WHARF ROAD, CITY ROAD, LONDON, N.,

Manufacture and keep in stock at their works (also a large stock in London) PIPES and CONNECTIONS 1½ to 48 inches in diameter; and make to order Retorts, Purifiers, and Tanks, with or without planed joints, Columns, Girders, Special Castings, required by Gas, Water, Railway, Telegraph, Chemical, Colliery, and other Companies.

NOTE.—Syphons and Covers are joint-faced if required, doing away with millboard and iron boring, or Syphons made without Covers, a socket being cast on and fitted with a small plug about 6 inches in diameter with lead joint. In either way preventing leakage.

MEMORANDUM FOR GAS COMPANIES.

TORBAY AND DART PAINT COMPANY, LIMITED,

SOLE PROPRIETORS AND MANUFACTURERS OF

WOLSTON'S
TORBAY PAINTS.

OFFICES:

23, GREAT GEORGE STREET, WESTMINSTER, LONDON, S.W.

WORKS:

DARTMOUTH AND BRIXHAM, DEVON.

TRADE MARK

These celebrated Paints are now very generally acknowledged to be the best and most economical in use. GAS COMPANIES especially have, by experience, proved that no others so fully meet their peculiar requirements, as they are not only UNAFFECTED BY GREAT HEAT and EFFECTUALLY RESIST SULPHURETTED HYDROGEN, AMMONIA, &c., &c., but they may be applied to GASHOLDERS that have hitherto been covered with the unsightly coal tar.

They are also cheaper than other paints and compositions; TWO COATS OF GENUINE WOLSTON'S TORBAY PAINT BEING EQUAL IN COVERING POWER TO THREE OF LEAD PAINT, or any of the numerous low-priced spurious oxides that are now in the market, whilst the durability of Wolston's is unrivalled.

The colours most approved for GASHOLDERS, PURIFIERS, SCRUBBERS, and all the plant and machinery used in and about Gas-Works, are—

FOR DARK TINTS.

No.	p. Cwt.	No.	p. Cwt.
13. Torbay Red	34s.	8. Bronze Green	36s.
6. Dart Brown	34s.	16. Torbay Chocolate	34s.
10. Carriage Red	34s.	4. Brixham Black	32s.
1. Torbay Brown	30s.		

FOR LIGHT TINTS.

No.	p. Cwt.	No.	p. Cwt.
7. Imperial Stone	34s.	19. Light Stone	36s.
29. Portland Stone	38s.	30. Bath Stone	38s.
31. Gray Stone	38s.	38. Buff	35s.

These Prices are for Paints in paste, carriage paid to any Gas-Works in Great Britain, in consignments of not less than 5 cwt.; but all the above colours may be had, READY MIXED FOR THE BRUSH, IN VARIOUS SIZED PAINT CANS WITH HANDLES, AT A UNIFORM PRICE OF 56s. PER CWT. (6d. PER LB.) carriage paid as above, in consignments of not less than 2 cwt., the sizes being 3 lb., 7 lb., 14 lb., and 28 lb. By taking the Paints in this convenient form, a considerable saving is effected in time, &c., as they can be immediately applied by any workman without the intervention of skilled painters to mix and prepare them; besides which all waste is avoided, and they may always be relied on as containing no adulterating or inferior material.

Where light colours are preferred, the work should be primed with two coats of No. 7, and finished with either of the other stone colours; and when the darker colours are selected, a priming coat of No. 13 is recommended.

Specimen Cards forwarded and Inquiries attended to on application to

23, GREAT GEORGE STREET, WESTMINSTER, LONDON.

THE
MANN & WALKERS' PATENT SCRUBBER.

Extensive use.

The successful and extensive use of the Mann and Walkers' Patent Scrubbers in all parts of the world has demonstrated their advantages, and entitled them to be received with credit and confidence. The number of them in use is about twenty times that of any other known means of purifying gas from ammonia.

Small quantity of Water required.

By a very small quantity of clean water (not more than 5 or 6 gallons per ton of coals carbonized) the whole of the Ammonia contained in the Gas is completely absorbed; the Gas, after only once passing through, issuing from the Scrubber outlet completely purified from Ammonia. The Scrubber gives no appreciable back pressure.

Residual Product obtained.

The Residual Product—namely, the Ammoniacal Liquor—is obtained at from 20 to 30 ounces commercial strength, which enables it, after being mixed with the weaker Liquor from the hydraulic main and condensers, to be sold to the Manufacturing Chemists, or converted into Sulphate, at the degree of strength found most profitable to the Gas Company.

Illuminating power increased.

The Scrubber is a Saturator, and the Gas being soaked in this strong solution of Ammonia in the lower columns of the Scrubber, is purified from a large amount of Carbonic Acid, and its Illuminating Power is thereby increased.

Small amount of power required.

The friction is so little, and the motion so slow, that the power necessary to work the Scrubber is almost inappreciable. A small gas-engine will work a pair of Scrubbers, purifying 2 million cubic feet of gas per day.

Beckton Gas-Works.

There are thirty of these Patent Scrubbers in the Beckton Gas-Works, equal to purifying 30 million cubic feet per day, and the total amount of engine power necessary to work the whole 30 is not equal to that given out by one 10-horse engine.

Reserve purifying power contained.

There is also a most important advantage arising from the height of these Scrubbers, in the reserve force contained in them. In the event of any stoppage, the mass of soaked and wetted material would continue the purification for hours, even if the supply of water and working were stopped from any cause.

Internal Materials not changed.

The changing of the soaking materials in these Scrubbers is very seldom required; they are well known to remain in action for seven years without being emptied.

Guarantee.

They are in all cases erected under guarantees; they easily fulfil the stipulations of any Act of Parliament, and the chemical restrictions of the Board of Trade; and in cost they are much less to a Gas Company than any other known means of purifying Gas from Ammonia.

C. & W. WALKER.

8, *Finsbury Circus, London, E.C.*

ANTI-CORRODO TUBES
(BARFF'S RUSTLESS PROCESS)

See Professor FOSTER'S *Article on "The Corrosion of Iron" in* JOURNAL *of March* 30, 1880.

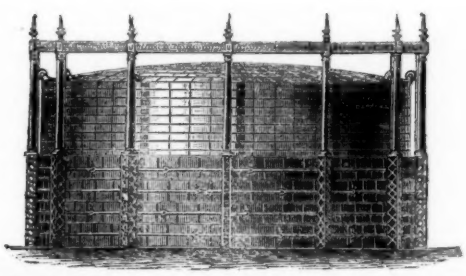
THE RUSTLESS AND GENERAL IRON COMPANY
(JAMES E. AND SAMUEL SPENCER),
Makers of ANTI-CORRODO (BARFF'S) TUBES AND FITTINGS
For Gas, Steam, and Water; also Black Galvanized and Enamelled.

WORKS: West Bromwich. *Quotations and Pamphlet on application to* 97, CANNON STREET, LONDON, E.C. LIVERPOOL OFFICE: 34, Moorfields.

JOHN HALL AND CO., STOURBRIDGE,
Manufacturers of FIRE-BRICKS, LUMPS, TILES,

AND EVERY DESCRIPTION OF FIRE-CLAY GOODS.
N.B.—A Stock of 15 and 16 in. CIRCULAR RETORTS always on hand. Other kinds made to order on short Notice.

J. & H. ROBUS,
BUILDERS AND CONTRACTORS
FOR THE ERECTION AND REBUILDING OF GAS AND WATER WORKS,
RETORT-SETTING—A SPÉCIALITÉ.
ROBUS'S IMPROVED RETORT-SETTINGS, guaranteed to Carbonize a large amount of Coal with a small per cent. of Fuel.
ESTIMATES GIVEN FOR MAIN-LAYING.
N.B.—All kinds of Fire Goods and Gas Apparatus supplied on the shortest notice.
Address:—J. & H. ROBUS, BELL GREEN, CATFORD, LONDON, S.E.



HENRY BALFOUR & CO.,
ENGINEERS, IRONFOUNDERS, AND GAS APPARATUS MAKERS,
39, FINSBURY CIRCUS, LONDON, E.C.
Works: DURIE FOUNDRY, LEVEN, FIFE, N.B.
MANUFACTURERS OF
GASHOLDERS, SINGLE OR TELESCOPE, WITH OR WITHOUT COUNTERBALANCE GEAR; TANKS, CAST & WROUGHT IRON.
BOILERS, CONDENSERS, CRANES, EXHAUSTERS AND ENGINES,
GIRDERS (Cast and Wrought Iron), IRON PIPES, PUMPS, PURIFIERS, RETORTS & FITTINGS, ROOFS, SCRUBBERS, SHAFTING, VALVES, WASHERS.
ANDERSON'S PATENTED INVENTIONS, VIZ.—
FOUR-WAY BYE-PASS VALVES, ENGINES AND EXHAUSTERS, REVOLVING BRUSH SCRUBBERS, GAS-WASHERS, FUEL-MAKING MACHINES, GOVERNORS, &c.
H. B. & Co. undertake Contracts for the Supply and Erection of Gas-Works, either for Towns or Mansions, or the Remodelling of existing Works.
SHIPPING ORDERS receive special attention.
H. B. & Co. having had large experience in this Department, undertake to ship, f.o.b., properly packed and marked for export.
ESTIMATES AND DESIGNS ON APPLICATION.

T. NEWBIGGING,
CONSULTING GAS ENGINEER,
5, NORFOLK STREET, MANCHESTER.

HENRY LYON,
MECHANICAL AND CONSULTING GAS ENGINEER
NORWOOD, NORTHENDEN ROAD,
SALE, NEAR MANCHESTER.

SANDELL AND SON,
PUBLIC ACCOUNTANTS,
2, GREAT GEORGE STREET, WESTMINSTER.
SANDELL AND SON having been engaged during the past 25 years in Gas Companies Accounts, either in Preparing or Investigating Statements for Parliamentary Applications, Arbitrations, and otherwise, offer with confidence their Services for similar purposes.

ALFRED LASS, F.I.Accts.,
SPECIAL ACCOUNTANT FOR GAS AND WATER UNDERTAKINGS,
30, GRACECHURCH STREET, LONDON.

Accounts Analyzed and Statistics Prepared for Parliamentary Proceedings, Arbitrations, &c.
The Forms of Account, which have been specially designed by Mr. Lass to meet the requirements of the Gas-Works Clauses Amendment Act, 1871, are now in use by many Gas Companies, Corporations, and Local Boards.

JOHN ROMANS, C.E., F.G.S.E.,
CONSULTING GAS ENGINEER
AND
CANNEL COAL FACTOR,
30, St. Andrew Square, EDINBURGH.

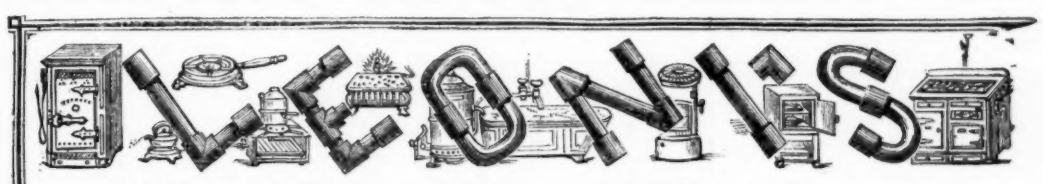
Plans and Estimates furnished; Gas-Works, Apparatus, Pipes, Machinery, Fire Goods, &c., supplied, or Attested and Shipped for Exportation.
GAS-WORKS TAKEN ON LEASE.

Mr. ROMANS has for upwards of 30 years been practically engaged in the Manufacture of Gas, and has, by extensive experiments, ascertained that by JUDICIOUS INTERMIXTURE of the lighter with the heavier gases, much of the rich Hydrocarbons CAN BE SAVED, which otherwise ARE LOST, during the process of manufacture. He is therefore enabled to give advice to those who favour him with their orders for Cannel, as to the class which will secure for their standard of illuminating power the HIGHEST ADVANTAGEOUS RESULTS.

ANALYSIS AND PRICES FORWARDED ON APPLICATION.

WOOD
TROUGHING
For Preserving Service-Pipes.
Price from Three-Farthings per Foot.
In any Lengths.
THOS. PROUD,
Brookfield Works, Icknield St., Birmingham.

HARPER & MOORES,
PROPRIETORS OF THE
BEST STOURBRIDGE CLAYS,
STOURBRIDGE.
Manufacturers of all Descriptions of
BEST STOURBRIDGE FIRE-BRICKS, LUMPS, AND CLAY RETORTS
Of all Dimensions for Gas-Works,
GLASS-HOUSE POTS & CRUCIBLES
ESTABLISHED 1826.
The Highest Award was obtained by H. & M., at the Philadelphia Exhibition, 1876, for Superior Quality of Manufacture. SILVER MEDAL, PARIS, 1878.



ILLUSTRATED CATALOGUE,
OF FAMILY GAS KITCHENERS,
COOKERS, HOT-PLATES, STOVES, BATH-BOILERS, &C; SENT FREE.
ADAMAS WORKS, ISLINGTON, LONDON. N.,
WAREHOUSE: 74, STRAND, W.C.

ROBERT MARSHALL,

CANNEL COAL MERCHANT,

198, ST. VINCENT STREET, GLASGOW.

SHOTT'S BOGHEAD.

HARTHILL CANNEL

Yields 14,920 cubic feet of 40·92-candle gas per ton.

THRASHBUSH CANNEL

12,530 cubic feet of 40·22-candle gas per ton, and 9 cwts. of good coke.

LOTHIAN'S CANNEL

Yields 12,500 cubic feet of 34-candle gas per ton, and 9 cwts. of excellent coke, containing only 4 per cent. of ash.

MUIRKIRK, No. 1, CANNEL

Yields 12,160 cubic feet of 32·5-candle gas per ton, and 10 cwts. of excellent coke, containing only 5 per cent. of ash. This cannel is almost free from sulphur.

OLD WEMYSS CANNEL

Yields 13,320 cubic feet of 32·5-candle gas per ton.

Prices and full analyses on application at above address, or from WEDDERSPOON, FERGUSSON AND Co., 21, Lime Street, LONDON, E.C.

HEBBURN MAIN GAS COAL.

This Coal is now highly approved of for gas making, and yields over 10,000 feet per ton of 15-candle gas, and about 14 cwt. coke.

For references and prices, either f. o. b. or by rail, apply to

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WANTED, by Samuel Thompson & Co., Colliery Office, Lancaster, APPLICATION for PRICES from Gas Managers who are prepared to receive Tenders for GAS COAL or CANNEL.

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Abstract of Analyses made by Dr. WALLACE, Gas Analyst for the City of Glasgow.

	Cubic Feet per Ton.		Illuminating Power.		Equivalent of a Ton in Sperm.
Plesio Boghead	13,165	....	36·16	....	1632
Brown Capledrae.	12,210	....	38·46	....	1610

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Are prepared to supply their celebrated **Real** Old Silkstone Gas Coal and Nuts. Prices quoted to any Railway Station, or f.o.b., Hull, Goole, Keadby, Grimsby, Liverpool, and Fleetwood. Every information given on application to above address, or to their Agent,

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CIRCULAR TO GAS COMPANIES AND OTHERS.

Stourbridge, Jan., 1880.

DEAR SIRS,—As the time for ordering stock for your general requirements for this year is approaching, we beg to call your attention to the various articles of our manufacture, and to solicit your early commands.

Fire-Clay Gas-Retorts.—As some of our friends appear to prefer these *machine made*, we have arranged to supply machine-made Retorts at same price as hand-made ones. At the same time, although it is to our advantage to supply machine-made, we do not recommend them, for the reason stated to you in our Circular of November, 1878. We have a very large stock of Retorts, all in good condition, and of such an assortment that we could supply any size on receipt of order.

Fire-Bricks and Fire-Clay Settings of all Shapes and Sizes.—We have a large and varied stock, or could make to special design at short notice.

Staffordshire Blue Bricks and Paving Bricks.—We shall be glad to submit prices and samples of these on hearing from you, with specification, and we venture to say our brand in these goods is unsurpassed. Hard Blue Paving Quarries make the best kind of Pavement for Retort-Houses, &c.

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Awaiting your esteemed favours,

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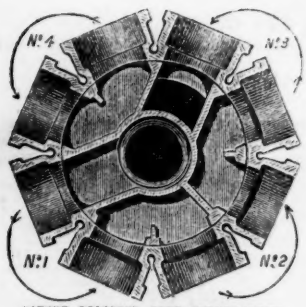
Note.—We shall be pleased to furnish Drawings and Specifications, if desired, and shall be most happy to see you or any of your Engineers here at any time; or, if you would like to see any of our representatives or ourselves at your Works, shall be glad to wait upon you by appointment.



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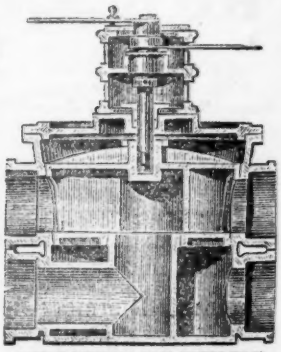

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By the use of which stoppages in service and other pipes are freed from naphthaline and other obstructions in a few minutes. PRICE 73s. net.

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